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Procedure Title: DECK OVERHAUL

Summary of Changes
Revision 2: Added records matrix

1. PURPOSE: This document provides the details required to overhaul the cassette tape decks that are part of the Data Transcriber 575T49 family**.**

2. SCOPE: All cassette decks accommodating the cartridge assembly NSN 6610-00-084-8695 located in the computer room fall under the purview of this work instruction. This is a very comprehensive and unique work procedure, on the fringes of the expertise of an electronics technician. A demonstration and checkout is necessary prior to use. Operational equipment is essential to the structural integrity programs (ASIP) of several weapon systems.

3. DEFINITIONS:

3.1. Deck: the aluminum platform and associated electronic and mechanical devices attached that accommodate the cartridge assembly.

3.2. Polishing: the elimination of scratches from the surface(s) of components.

3.3. Surface finishing: the restoration of metal surfaces to a brilliant luster, by the use of leather, and or polishing compounds.

3.4. Overlap: An either stationary or rotating wheel, disk, or slab of leather or metal for polishing and smoothing.

3.5. Round polish technique: The use of a variable speed electric drill mounted as a lathe, along with various devices serving as arbors, to polish round objects. Use of abrasive paper, polishing compounds and suitable backing surfaces may be included for overlap purposes.

3.6. Flat polish technique: The use of 2/0 abrasive paper, NSN 5350-00-186-8856 and an appropriately shaped mass for overlap purposes with a lubricant to eliminate defects from flat surfaces of components.

3.7. M2 side: identifies the side of the deck occupied by the M2 torque motor, which is positioned closest to the front of the deck. The “M3 side” of the deck has the torque motor situated near the center of the deck. These references are used to locate the positions of other parts.

3.8. Galling: The deep scratching and deformation of a metal surface due to friction.

4. RESPONSIBILITIES: The ENFOC chief is responsible to insure equipment is operational in support of the weapon system program directors (SPD). The electronics technician assigned to the computer room will comply with this work instruction; the electronics engineer is the alternate.

5. INSTRUCTIONS:

NOTE

Unless otherwise specified, all figure, sheet, plate and index numbers refer to T.O.33DA115-3-1, figure 5-11, pages 5-84 through 5-89.

5.1. Coordinate all maintenance activities with the R/T transcriptionist before beginning this maintenance. The total time required for this overhaul can be from twenty four to forty eight man-hours.

5.2. Work bench preparation.

5.2.1. Prepare an unobstructed work area of the workbench at least two feet by four feet. Remove the antistatic mat. Retain the cork mat. Cover the entire reserved area with scrap conductive plastic sheet and tape it to the bench surface. Place three heavy-duty glass parts containers within reach on this surface to store removed hardware.

5.3. Turn off the power to the equipment bay.

5.4. Turn off the power to the panel that contains the deck.

5.5. Deck removal. You will need to document your work for future reference. Keep a daily log of your progress and record specific data points called for in this work instruction that you will need to complete this job.

5.5.1. Open the transcriber panel outward at least one-foot from the front of the cabinet.

5.5.2. Disconnect the Head cable connector *P2*, from the top left rear of the deck and the control cable *P3,* from the underside left rear of the deck.

5.5.2.1. Operate the Engage/Disengage lever to the engage position. Note the height of each of the actuator *guides* (plate E index 77). They should be at least 1mm from the top of the deck surface. Make a written note of the actual depth of each, by the *guide* number, which is etched on the surface of the *guides*, for corrective action later in this work instruction set (paragraph 5.30).

5.5.3. Remove the cotter pin from the *Engage/Disengage* lever, and remove the lever (*shaft handle*) from the lever *camshaft* (plate J index 106).

NOTE

Any reference to *screws* will imply that any flat and lock washers associated with the screws, are, and will remain a set.

5.5.4. Remove the three machine screws at the three corners of the deck that fasten the deck to the chassis.

CAUTION

In the following step, avoid contact between the deck and the components/connections on the inner side of the front panel.

5.5.5. Grasp the left hand and the right hand *Spring Mechanism Assemblies*, index 8 and 9, as close to the retaining screw base as possible (to avoid stressing the pin barrels), and tilt the rear end of the deck upwards. Carefully lift the deck out of the chassis.

5.5.6. Transport the deck to the workbench. Position the deck such that the *camshaft* is facing you.

5.5.7. Manually, and simultaneously rotate the capstans in opposing directions with your thumbs. Try to sense the amount of force necessary to cause them to rotate. They should not turn freely.

5.5.7.1. Turn the deck upside down with the head cable facing you. Observe that there is a *pulley* on your left that has a disk with three *screws* in it. This item is the *clutch*, which is always on the M2 side of the deck. Observe the fastening *nut* on top of that *pulley* while you reach under the deck with your forefingers and repeat the counter-rotation test.

5.5.7.1.1. As you rotate the capstans, you should see the belt slip almost simultaneously when the nut begins to turn.

5.5.7.1.2. Make written note of the result of this test: If the belt never slips then the clutch is too loose, if the belt always slips then the clutch is too tight. A discrepancy here will have to be corrected much later in this work instruction.

5.6. Deck disassembly. There are three heavy-duty glass containers to store small parts during this work instruction. Reserve the two containers etched as 2 and 3 for parts removed from the M2 and M3 *actuator* assemblies plate E, item 70. Use container 1 for small parts from the other subassemblies.

5.6.1. Loosen the three screws at the tallest *pulley* (plate C index g).

5.6.2. Remove the two Teflon *drive belts*, and place them in a safe area to avoid damage. Turn the deck around so that the lever *shaft* is facing you.

5.6.3. Reference plate *F*. Index 50 is the *J3* connector bracket, it is fastened to the Torque Motor *plate* index 60, by a small Phillips head screw. Remove that screw, place it and all other small parts into container #1 until instructed otherwise.

5.6.4. The torque motor *plate* is fastened to the deck with four screws, index 61. Remove the screws.

5.6.5. Observe the position of cables and the retaining wire ties (do not cut the wire ties, they are loose and work best that way) in this step because you will have to dress the cables in the same fashion later in the overhaul. Carefully lift the torque motor *plate* upward about one inch, rotate it, and position it to expose the *yokes*, index 82 and the *pin actuator assemblies*, index 65 and 66. Avoid stressing the attached cables.

5.6.6. Determine which *yoke* arm connects to M2, now located on your right side. Look at the area where the two *yoke* arms meet and lap past each other. Below that juncture, determine where *yoke* arm 2 engages the *actuator cam,* plate J – index 105. It will either engage the *cam* towards the very end of the *shaft* or toward the middle of the *shaft*. Earlier you made a written note of the height of the actuator *guides*. Add to that note where *yoke* arm 2 engages the *cam*, towards the end or towards the middle of the *shaft*. You will need this information much later in this work instruction.

5.6.7. The *Engage-Disengage mechanism* consists of a *shaft*, plate *J* – index 106, held in place by *bracket and bushing assembly*, plate *C* – index 87 and 100. Remove the four screws that fasten the *brackets* to the deck. Take notice that the two short screws belong with the bracket closest to the outer edge of the deck. They are color coded black either on the head or the shank, they are short due to the thin area on the deck to which they fasten and to achieve clearance for the *latch assembly*.

5.6.8. Gently press downward at the junction of the two *yokes* and the *shaft*. This will remove pressure from the *yokes* to the *actuator cam*, index 105 (on the end of the *shaft*). Gently remove the *Engage-Disengage mechanism* from the deck, taking care not to score the *cam* on the end of the *shaft*, or the surfaces of the *yokes*. Place the *engage-disengage mechanism* out of harms way, additional work on this mechanism will be done much later in this work instruction (WI).

5.6.9. Observe that removal of the above mechanism exposed two hex screws that fasten the cassette *Latch Assembly* to the deck. This item is not indexed, but it is visible on the bottom of plate C to the left of index 87 and below index 42.

5.6.10. Remove the two hex screws and place the cassette *latch assembly* out of harms way.

5.6.11. Observe that each *yoke* pivots on *pin*, item 83, which is held in place by a *retaining rin*g. (Replacement rings, NSN5365-00-721-8187, are stored at location C5-2-B8). Remove the two *retaining rings* from the two yoke *pins*.

NOTE

In the following step observe that each *pin actuator* assembly is marked with a Roman numeral II or III. This identifies the position of the actuators in the deck. They are **not interchangeable**. The assembly labeled II belongs in the front corner of the deck. All of the *internal components* are etched with the same number.

5.6.12. In this step you will observe that the two *Pin Actuator Assemblies*, plate B, index 65 and 66, will drop through the deck to the work bench surface. Remove the two yoke *pins* previously discussed. Remove the two *yokes* and set them aside out of harms way.

5.6.13. Remove the two *pin actuator assemblies*, and set them aside out of harms way.

5.6.14. Return the torque motor *plate* to its normal position, and fasten it back in place with only two screws set at a diagonal.

5.6.15. Rotate the deck for access to the top surface.

5.6.16. The *Cassette Retainer Assembly* consists of index 38, 39, 40, and 41 of sheet 1, and index 42 through 47 of plate C. Note the position of the *retainer*, index 38 in figure 5-11 sheet 1. It is full forward and very close to the narrow "end stop" of the *plate*, index 40. Remove the six screws; remove the entire assembly from the deck. Set the *pin*, index 46 and the *pin spring* index 44 out of harms way. There may be shims on either side of the slot on the deck, if so fasten them in their original place with scotch tape.

5.6.17. Remove the two screws from the *retainer*, index 39, and place the components out of harms way. Take note that these screws have had their heads reduced in height and that they are short.

5.7. Polishing of critical surfaces.

5.7.1. Place the deck out of harms way. You will need plenty of work surface to accomplish the following tasks.

5.7.2. Collect the following tools and materials;

- abrasive paper, grit 2/0 an 3/0, from bin location C2-4-C,
- drill stand, from bin location C6-7-C,
- 3/8" VSR electric drill,
- flat appliance kit,
- round appliance kit,
- polishing compounds kit,
- deck tool kit,
- general purpose oil,
- one inch scotch tape in dispenser,
- polishing leather and cloths.

5.7.3. Mount the drill stand to the bench. Mount the drill into the drill stand.

NOTE

All surfaces, internal and external, that move in contact with other surfaces will over time show signs of wear in the form of scratches parallel to the direction of movement. This galling must be eliminated. Failure to recondition the surfaces will result in degradation of transcriptions and costly damage to cassettes and the deck itself.

5.7.4. Get the 10x12" aluminum plate mass and place it on the workbench. Inspect it to be sure that it is smooth and free of any debris. Place a new sheet of 2/0 abrasive paper on the mass.

5.7.5. Begin the polishing with the *cassette retainer assembly* components. Get the *retainer*, index 38. Inspect the mating surface for galling. Smear a couple drops of general-purpose oil on the surface. Place it on the paper, and with moderate pressure draw the piece back and forth on the abrasive paper to polish out any scratches. Insure that the paper does not run dry of oil, if it does, you will cause more scratches to occur. Be patient, this can be a very long process. For the duration of this WI, this technique for polishing flat surfaces will be invoked as the "flat polish".

5.7.5.1. When the *retainer* is completed, get a sheet of Texwipe tissue (white paper towels) to place polished components on, in an out of the way location on the bench. Wipe off any excess oil before placing polished components.

5.7.5.2. Get the *plate* from the *cassette retainer assembly*. This component is much more difficult to polish than the *retainer* is. There are four surfaces on this piece that require polishing the top, bottom, and the two surfaces inside the long slot.

5.7.5.2.1. Place the *plate* in the bench vise (with the blue soft jaws installed) such that the slot is readily accessible above the jaws and horizontal.

NOTE

Unless otherwise specified, the vise will always be used with the soft jaws installed.

5.7.5.2.2. Get the small, 4x1x1/4", aluminum mass from the flat appliance kit. Cut a length of the previously used abrasive paper approximately 4x7". Wrap the mass with this strip. Smear one surface with a coating of oil. Insert this device into the *plate* slot. Grasp the mass with one hand on each end. Keep the mass as horizontal as possible. With firm pressure, draw the mass back and forth along the full length of the slot. Do not allow the inner surface to "round off" the edges. Periodically inspect the surface for progress and uniformity until the surface is free of scratches. Repeat this step for the second side of the slot. Once again, extreme patience is required, this is a time consuming process.

5.7.5.2.3. Remove the *plate* from the vise to polish the underside. Get the *guide*; index 42 that is also part of the *cassette retainer assembly*. In this step you are going to use the wide flat surface of the *guide* as an abrasive block to polish the centermost sides of the *plate* bottom, parallel to the slot.

5.7.5.2.4. Cut a strip of 2/0 abrasive paper 2x6". Wrap the *guide* with the paper such that the wide fat surface is smooth.

5.7.5.2.5. Position one end of the *plate* against the base of the drill stand for a backstop, with the underside of it facing up. Apply a coating of oil to the abrasive paper on the wide flat surface of the *guide*. Center the *guide* over the slot and with firm pressure draw the guide back and forth. Keep the *guide* centered along the length of the slot as you polish. Periodically inspect the *plate* for progress and uniformity until the margins (approximately 3/16" wide) on either side of the length of the slot is free of scratches

5.7.5.2.6. Polish the top face of the *plate*. Use the "flat polish" technique (re: par. 5.7.5.) until the *plate* is free of scratches. When completed, wipe the *plate* free of the oil and place it on the clean towel you previously provided for polished parts.

5.7.5.3. Get the *guide (*index 42). Observe that there are four surfaces that come into contact with the *plate*, index 40. You are going to use an outside edge (corner) of the large aluminum plate mass for a right angle polishing surface. Place a sheet of 2/0 abrasive paper such that the edge of the paper will fold down about one half inch past the top surface of the mass. Put a good crease in the paper, smear a liberal amount of oil about one half inch on either side of the crease. Place the *guide* such that an inside corner fits over the outside corner of the plate that has the paper on it. With firm pressure draw the *guide* back and forth until both contacting surfaces are free of scratches. Repeat the procedure for the opposite two surfaces of the guide. Replenish the folded paper as required, and remember to keep oil in the process.

5.7.5.4. Polish the last major component of the *cassette retainer assembly*, which is the long *pin*, index 47.

CAUTION

Practice accelerating the drill by depressing the trigger slowly and gradually increasing the RPM. Get the feel of the sensitivity. It is very easy to use as a lathe provided you concentrate on the job at hand. You have <u>full control</u> of the drill speed with the trigger.

WARNING

Do not operate the drill without wearing a full-face mask.

5.7.5.4.1. Remove the *spring* and the *washer* from the *pin* and place them in the glass container. In the round appliance kit, find the orange plastic bushing (1/2Lx3/8"o.d.). Insert the *pin* into the bushing and move the bushing all the way down to the *roll pin*. Insert the bushing end of the *pin* into the chuck of the electric drill, and tighten the chuck firmly.

5.7.5.4.2. To remove severe scratches, get a 1x2" piece of abrasive paper; apply a small amount of oil to the center of the paper. Wrap the paper around the pin once and pinch the paper closed with your thumb and forefinger. <u>Keep the pin centered in the chuck to prevent wobbles.</u> Gently depress the drill trigger and "find" the "balanced centering" for the pin as it rotates within the abrasive paper. It

is not necessary to use a high speed to polish any component in this manner. Stop frequently to replenish either the paper or the oil. Do not attempt to polish any component without the use of oil. When all of the scratches are gone remove the pin from the drill, wipe off the pin and place it on the towel you previously provided for polished parts. For the duration of this work instruction, use of the drill and appliances will be referred to as the “round polish” technique.

5.7.6. In one of the earlier steps you removed the *cassette latch assembly,* it must now be disassembled in preparation for polishing.

5.7.6.1. Originally, this item was not to be maintained in the field, therefor no parts breakdown was published. Attachment 3, figure 1 is provided for that purpose.

NOTE

It has been proven that new cassette latch assemblies
Do not last. When they are reworked via this procedure
They are superior in performance and reliability to the original.

CAUTION

Read the following 4 steps in their entirety before proceeding.
If this is your first experience with the procedure you may want to
inspect the spare latch assembly parts in bin location C1-10-E-1
for familiarization.

5.7.6.2. Place the *cassette latch assembly* in the vise such that the two sides of the *lever* are engaged by the jaws up to the lever lip, and the two ends of *guide pin* is exposed. Tighten only to a snug fit.

CAUTION

In the following steps do not remove the pin punch
from the assembly until so instructed. The assembly
is spring loaded and you could waste a lot of time
searching for launched pieces.

5.7.6.3. Get the 1/8” pin punch and with gentle tapping, drive the *guide pin* out of the lever. **DO NOT** remove the punch from the lever yet. Operate the *stop pin* away from the *trigger pin* to insure that the *trigger pin* is elevated to the cassette latching position.

5.7.6.4. With the pin punch still in place, remove the *cassette latch assembly*, from the vise.

5.7.6.5. Place one hand directly on top of the *trigger pin* to prevent it and the *trigger spring* from launching across the room as you remove the pin punch. Remove the pin punch. Slowly allow the spring tension to relax then remove the *trigger pin*, the *trigger spring* and the *spring guide* from the assembly. Place the removed small parts in the heavy-duty glass parts container number 1.

5.7.6.6. You now have the *housing* with three more internal parts to disassemble: *stop pin*, *latching cylinder*, and *cylinder spring.*

5.7.6.7. Place the *housing* in the vise such that the long walls are flat to the vise jaws, the *stop pin* is downward, and the centermost threaded screw hole is even with the outside edge of the vise jaws. Place the glass parts container next to the vise; rotate the vise so that the stop pin, when driven out, will fall into the glass container.

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5.7.6.8. Get the 5/32” inch pin punch (silver handle) for the next step.

5.7.6.9. From beneath the *housing*, operate the *stop pin* until the pin-seating hole of the *latching cylinder* is aligned with the centermost mounting screw hole of the *housing*. Place the pin punch into the pin-seating hole of the *latching cylinder*. Test that it is in place by trying to move the *latching cylinder*.

CAUTION

In the following steps do not remove the pin punch until instructed to do so.

5.7.6.10. With gentle taping drive the *stop pin* out of the *latching cylinder*. Do NOT remove the pin punch.

5.7.6.11. Place and keep, a finger directly against the 5/16” hole of the *housing*, to catch and slowly release, the *latching cylinder* and *spring*. Remove the pin-punch. Remove and place the *latching cylinder* and *spring* in the glass container.

5.7.7. Polishing the components of *cassette latch assembly* will require use of the stand-mounted drill and the plate mass and various pieces from the appliance kits.

5.7.7.1. The *housing* will be polished first. It has three surfaces that experience wear: the walls of the *trigger pin* chamber, and the *latching cylinder* chamber, and the lower front flat surface that engages the *lever.*

5.7.7.1.1. Get a cotton swab and clean out the two chamber walls of the *housing*. Inspect the walls for scratches along the length, or concentric machining grooves.

5.7.7.1.2. To polish the latching cylinder chamber, select the ¼” diameter shaft from the round kit. To polish the trigger pin chamber, use the 5/16” diameter shaft. You will use the stand-mounted drill as a low revolution lathe.

CAUTION

Always use a full-face mask when operating the drill. Always begin drill rotation with a slow speed. Keep a firm grip on the item being worked.

5.7.7.1.3. To remove deep scratches or machining grooves, use a 1-1/2”wide strip of 2/0 polishing paper fastened to the shaft with a ½” tab of scotch tape. Form the paper around the shaft and insure that the total O.D. will fit inside the chamber before using the drill. Install the shaft into the drill chuck, apply a liberal amount of oil to the polishing paper. Select the rotation direction of the shaft such that the paper will tighten around the shaft as it rotates. Operate the drill slowly to seat the selected *housing* chamber onto the papered shaft. Be sure that the paper does not run dry of oil. Inspect frequently. Keep a firm grip on the *housing* at all times. This is the “round polish” technique.

5.7.7.1.4. To remove shallow scratches, install the shaft into the drill with the scored end out. Get some cotton from the polishing bag. While spinning the drill at a slow to moderate speed, feed some cotton onto the shaft to form a thick swab. Coat the swab with some polishing compound. Operate the drill slowly to seat the selected *housing* cylinder onto the swabbed shaft. Inspect the work frequently. Keep a firm grip on the *housing* at all times.

5.7.7.1.5. Polish the lower front surface of the *housing* that engages the *lever* using the “flat polish” technique. Set the *housing* out of harms way when completed.

5.7.7.2. Get the *lever.* The only surface on this piece that requires polishing is the lower half of the inner flat surface, opposite the lip, that would contact the front of the housing when assembled. From the deck tool kit, get the plywood “latch assembly-finishing block”. Get a piece of 2/0 abrasive paper 6x2”. Wrap it around the finishing block to form a six-inch long abrasive surface. Apply a liberal amount of oil to the narrow side of the block. Place one end of it next to the drill stand for an end stop. Straddle the finishing block with the *lever*. Place your forefinger beneath the lip of the lever, and your thumb on one side and second finger on the other side of it. Proceed to use the “flat polish” technique, occasionally rolling the bottom edge along the path. Set the part out of harms way when completed.

5.7.7.3. Get the *trigger pin* and the *latching cylinder* in preparation for polishing.

NOTE

If you were to place the *trigger pin* and the *latching c*ylinder together as shown in attachment 3, you would see that some surfaces at their intersection have been “rounded off”. This was done to minimize friction between the two parts, providing a “hair trigger” effect. The pressure generated between the *lever* inside bottom surface where it rides the front wall of the *housing* is reduced, so is the wear between these two surfaces. Care must be taken to preserve the curvatures yet not round off too much, because that will prevent the *trigger pin* from ever “latching down” to accept the insertion of a cassette. Also note that the opposite ends of the two pieces have been rounded off, this prevents scoring the inner walls of the *housing*. Originally, the latch assemblies were high failure items with frequent jamming. You might want to compare these pins with those located in bin location C1-10-E-1, which contains salvage, parts from long ago.

5.7.7.3.1. To polish the *trigger pin* find a wooden dowel in the appliance kit that fits very snugly into the spring chamber end of the *trigger pin*. Install the dowel into the drill. Press the trigger pin spring chamber onto the dowel; use some cotton if additional tightness is required. Get a taffy stick from the flat appliance kit, wrap one end of it with polishing paper, and oil the paper. Polish out the scratches,

gingerly taking care not to dislodge the pin from the dowel. When finished place the pin in the glass container.

5.7.7.3.1. Get the *latching cylinder* and polish it with the same process that you used above.

5.7.8. Get the two *yokes*, index 82 in preparation for polishing.

5.7.8.1. Observe that each *yoke* has a *cam follower*, plate B index 80, attached to the single arm end with two screws. Note the alignment of the *follower* with respect to the indentation at the single arm end, you will need this reference for re-assembly. Remove the *cam followers* from the *yokes*.

5.7.8.1.1. There is only one surface on the *cam follower* that needs polishing, that is, the surface that engages the cam. Polish it using the "flat polish" technique. Insure that the three corners bordering this surface are slightly rounded to avoid scoring the *cam*. Place the *followers* in the glass container when finished.

NOTE

There are eleven surfaces on each *yoke* that require polishing. A most critical surface is on the single-arm end that faces the *follower*, this is the end where the *cam*, plate J index 105, provides the lift pressure to raise the two *actuators*, plate E index 70. This arrangement is visible on plate B, in the area of indexes 80 and 82. Any scratches on this surface, "cam contact surface" will seriously score the *cam*. There are no cams available in the supply system (cam restoration is addressed later in this work instruction).

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5.7.8.2. Get one of the *yokes*. Use the "flat polish" method to eliminate any surface defects from the "cam contact surface". Insure that the three edges bordering the cam contact surface are slightly rounded just enough to keep from scoring the cam with a sharp edge.

5.7.8.3. Polish the two sides facing the pinhole and the four sides facing the slots at the fork end of the *yoke* using the flat polish technique.

5.7.8.4. Get a 1/8" diameter shaft from the round appliance kit. Get a 1x1 ¾" piece of 2/0 abrasive paper and tape it to one end of the shaft. Form the paper so that it wraps around the shaft snugly. Install the shaft into the drill/drill stand. Coat the abrasive paper with a light coat of oil. Polish the inside surface of the slots at the fork end of the *yoke*.

5.7.8.5. Get a cotton swab and clean the *yoke* pinhole. Inspect the wall of the hole. If there are scratches, eliminate them using the parts and method from the previous step. Place the *yoke* out of harms way. Repeat the appropriate previous steps for the second *yoke* and set it out of harms way. The yokes will be reinstalled much later in this work instruction.

NOTE

The *actuator assemblies* are described in two locations: In plate B as index 65 and 66, then in detail, in plate E as Index 68 through 77.

CAUTION

Do not co-mingle components between the *actuator assembly* marked 2 and the other marked 3.

5.7.9. *Actuator* disassembly. Get the *actuator assembly* plate B index 66, it is etched with a 2 on the top of the *guide*, plate E index 77. Get the heavy-duty glass container etched 2, use this container for the small parts removed from *actuator assembly* 2 only.

CAUTION

Failure to comply with the **emphasized** steps below will result in **damage**. Read the next two steps completely before proceeding.

5.7.9.1. Rotate the *guide*, plate E index 77, so that the two *plunger* pins, plate E index 76, are aligned in a **straight line** with the large *pin* (brake release pin), plate E index 68. This **alignment** is **critical** and **must be maintained** to disassemble the actuator assembly.

5.7.9.2. Position the *actuator* on its round side and roll it until a pinhole, plate E index 69 is at the top. Get a 5/32" pin-punch. **Verify** that the two *plunger* pins and the brake release *pin* are **still aligned in a straight line**, then **lightly** drive the roll pin until it releases into the assembly. Roll the assembly 180 degrees to expose the other pinhole. **Verify** that the pins are **still aligned** and lightly drive the roll pin until it releases inside the assembly.

CAUTION

In the following step, the two very small roll pins you dislodged will be present and difficult to find. Go slowly so you don't lose them.

5.7.9.3. Get a white Texwipe towel. Carefully separate the two halves of the *actuato*r assembly, plate E index 70 from index 78 by simultaneously pulling and twisting. This will expose the internal components. Not shown on plate E are three thin Teflon washers. Remove and wipe clean, each of the internal components taking care not to damage the washers. Place these components in the glass container etched "2". Set all of *actuator* 2 components out of harms way.

CAUTION

Do **not** commingle parts between *actuator assemblies* two and three. There are sufficient differences in the wear patterns and dimensions to cause problems. As you complete polishing each component put it into the appropriate container.

5.7.9.4. Get the *actuator* etched 3. Get the container etched 3. Repeat the above three steps, **observing the cautions** for disassembly of the *actuator*.

5.7.10. Polishing the *actuators* will require many variations of the "round polish" technique, and a lot of time. You will work each actuator assembly separately to avoid co-mingling parts. Begin with *actuator assembly* 3.

5.7.10.1. Get the actuator *base* section plate E index 70, place it before you on the bench, with the square section on the bench. The very top surface, normally covered by a large Teflon washer, should be free of scratches. However, the inside (1-1/8" dia.) cylinder wall most likely has a large number of concentric scratches. From the round appliance kit, find the fixture that has an index 77 guide attached to a gear and 3/16" diameter shaft, and secure it into the drill chuck.

5.7.10.1.1. Get a fresh sheet of 2/0 abrasive paper and take it to the paper cutter and cut the entire sheet into 5/8" wide strips parallel to the narrow side of the paper.

NOTE

Read the following three steps completely before proceeding.
Go slowly to develop the feel of the process. This is a variation of the "round polish technique".

5.7.10.1.2. Attach one end of an abrasive strip to the guide fixture in the drill/drill stand with a short tab of scotch tape. Shape the paper around the fixture by slowly rotating the drill in a direction that causes the paper to tighten around the fixture. Oil the paper liberally on the last two inches. While slowly rotating the drill, insert the papered fixture into the large chamber of the actuator *base*.

5.7.10.1.3. Always hold the *base* firmly while it is engaging the drill fixture. Lock the drill speed. Apply a moderate pressure toward the axis of rotation only. Rotate the *base* continually with one hand alternating to the other hand. Do **not** apply inward (toward the drill) pressure. Do **not** allow the top edge of the actuator *base* to pass beyond the blue separator toward the gear edge of the fixture.

5.7.10.1.4. Inspect the progress of the polish frequently, do not allow the paper to run dry of oil. As the paper looses its grit you can tear off the bad end and insert a slightly longer piece in a lap fashion beneath a previous wrap of the paper. You can also increase the tightness of the fit by doing this. This is a time consuming process. Do not use a more coarse grit paper to speed up the process because it will only create more scratches. The test for completion of this process is a visual inspection, and by running the fingernail of your forefinger up and down the depth of the inner wall, if there are scratches, you will feel them or see them. When finished place the actuator *base* near the appropriate glass container.

5.7.10.2. Get the actuator assembly *sleeve*, plate E index 78. There are two internal surfaces of interest. The ¼" shelf facing the large diameter cylinder wall is normally protected by a Teflon washer and should not require polishing, unless some foreign matter was ingested. The 1-1/4" diameter inner cylinder wall however, normally will have many concentric scratches, and they must be polished out. Use the same appliance and method as you did in the above four steps.

5.7.10.2.1. In the event the ¼" shelf of the *sleeve* is scored you will need to change drill appliances. Get the 1-1/2" diameter polishing arbor from the round appliance kit. Get the 1-1/2" diameter 2/0 abrasive paper disks from the polishing compounds kit (if there are none left you will have to cut some out with an Exacto knife). Install one disk on the arbor and install it into the drill/stand.

5.7.10.2.2. Apply two drops of oil to the shelf of the *sleeve*. Use the "round polish" technique of previous steps. Replace the abrasive disks frequently, do not allow the disks to run dry of oil. Double-check the *base* that you previously finished, if the top flat surface needs polishing use the same fixture to do it now. Return the *base* to its safe location near the other parts of *actuator assembly* 3.

5.7.10.2.3. Get the *sleeve* again. Inspect the ¼" shelf at the bottom of the *sleeve* cylinder. It is normally protected by the small Teflon washer and may not require polishing. However if it does, get the 1-1/16" diameter arbor from the round appliance kit, and get some 1-1/16" diameter 2/0 abrasive disks (if there are none left, cut some out with an Xacto knife). Polish the shelf using the round polishing technique as you did for the previous steps. Set the *sleeve* out of harms way with the other parts of the *actuator assembly* 3.

5.7.10.3. Get the (actuator) *bushing*, plate E index 71 from actuator assembly 3. There are five surfaces on this item that require attention: the top (consisting of two half-moon shaped surfaces), the two parallel sides of the slot, the outer edge of the top disk, and the underside of the top disk (that normally faces the ¼" shelf inside of the actuator base, plate E index 70.

5.7.10.3.1. Use the flat technique to polish the top surface of the (actuator) *bushing*, normally there is very little wear on this surface.

5.7.10.3.2. To polish the top outside round surface and the adjacent ¼" undersurface of the *bushing* you will need a specialized shaft. From the round appliance kit, find a shaft that is approximately 2x3/8", with a strange looking end that is 3/16" square, leading to two sets of 1/16" shoulders. Secure the hexagonal end of the shaft into the drill chuck. Observe that the square end of the shaft with the narrow shoulder, will fit into the square hole of the *bushing* with the first set of shoulders fitting loosely in between the channel walls. Get a small wad of cotton; this will be used as packing to provide a very snug fit of the *bushing* onto the shaft. Feed the small cotton wad onto the square end of the shaft. Align the channel of the *bushing* so that the shaft will penetrate into the square hole and the first shoulder set is inside the channel. Manually force the *bushing* onto the shaft as described (it may take practice to find the right amount of cotton). Test the snugness of fit, it should not come off very easily. Test that the bushing remains in place while the drill is rotating. Polish the two surfaces using the round polish technique.

5.7.10.3.3. To polish the two walls of the *bushing* keyway get the red-handle hardwood paddle (4-1/2" x 7/32") out of the flat appliance kit. Cut a strip of 2/0 abrasive paper, 3x2", and wrap it around the square end. Fold the two bottom edges sharply. Oil and insert this fixture in the slot and polish the walls.

5.7.10.4. Get the (centering) *guide*, plate E index 72. There are nine surfaces requiring polish on this component. The easiest surface is the outside round surface. There are four half-moon surfaces, and there are four sets of 3/32" tall sidewalls (keys that fit into the keyways of the two adjacent parts).

5.7.10.4.1. Polish the four sets of sidewalls using the 4-1/2x8/32x1" hardwood paddle from the flat appliance kit and the flat polish technique**.** Note that all of the vertical corners are very slightly rounded, retain this feature.

5.7.10.4.2. To polish the four half-moons, use the corners of the large aluminum mass and the flat polish technique as in paragraph 5.7.5.3. The outer perimeter of the half-moons is very slightly rounded to the wall of the outside surface, retain this feature.

5.7.10.4.3. To polish the outside round wall of the *guide*, get the black 1-1/2x3/8", hex head bolt with the rectangular nut. Insert the bolt through the center hole of the guide, and tighten it in place with the nut. Secure this assembly into the drill chuck. Polish the outside wall with the round polish technique.

NOTE

Read the following paragraph completely before proceeding.

5.7.10.5. It is now necessary to separate the copper colored (plunger) *base* from the (plunger) *guide*. That is, plate E index 73 from index 77. From the deck tool kit get the 3/32" hex driver. From the bottom of the *base* carefully remove the two hex head screws and place them in glass container three. Separate the *base* from the *guide* carefully so that you don't lose the *springs* and *plungers*. If there is an aluminum disk (shim) on the base, carefully remove it, do not distort it. Place it in glass container three. Remove the two *springs*, plate E index 75 and place them in glass container three. Remove the two *plungers*, plate E index 76 and place them in glass container three. Place the *guide* in glass container three also.

5.7.10.5.1. Get the (plunger) *base*, plate E index 73. There are nine surfaces requiring attention on this component. The fully flat round surface should not show any wear, because a Teflon washer protects it, however if it does need polish use the flat polish technique. Polish the flat surfaces of the two half moon sections by the flat polish technique.

5.7.10.5.2. Polish the two walls of the keyway with the same 4-1/2" hardwood paddle and technique that you used on the *bushing*.

5.7.10.5.3. From the round appliance kit get the plastic envelope; inside the envelope get the ½"Lx3/16" hex shaft with the bolt and washer. This will be the arbor for the *base* polish on the three round edge surfaces. Screw the hex standoff to the *base* and secure the assembly into the drill chuck. Get a taffy stick from the flat appliance kit. Be sure that the surface is not warped. Get a strip of 2/0 abrasive paper about 2''wide and wrap the stick once, square off the corners sharply and use it to polish the two surfaces. Be careful not to touch the 7/32" round surface as you work. You will see a very slight radius on the outside corners of the round surfaces, maintain this feature. Polish with the round polish technique.

5.7.10.5.4. Only one surface remains to be polished, that is the 8/32" ledge, it may not require polishing because a Teflon washer protects it. If it does need polishing, then use the taffy stick as a geometric chord and the round polish technique. Disassemble the fixture replace the hex standoff to the original containers.

5.7.10.6. Get the (plunger) *guide*, plate E index 77. There are three surfaces requiring attention on this component: the ½" tall outside round surface, and the two chambers that contained the *plungers*. Clean the plunger *guide* with a Texwipe towel on the outside and inside the cylinders as well. Closely inspect the chamber walls for concentric machining grooves, they should be all gone by now. Also inspect them for axial scratches. If either condition exists, get 1-1/2x3/16" shaft from the round appliance kit, attach a 5/8x 1-3/4" strip of 2/0 abrasive paper with a short piece of scotch tape and polish each chamber with the round polish technique.

5.7.10.6.1. From the round appliance kit get the 1” gear with the 1x3/16” shaft, two 3/8”L x 3/32” hex socket head screws and the 1” blue plastic spacer. Attach the plunger *guide* to the gear and spacer with the two screws. Secure the shaft into the drill chuck.

5.7.10.6.2. In the next step you are going to use the small aluminum plate mass as an “overlap” plate, and, as a lever, to provide both a smooth surface and light pressure between the abrasive paper and the round surface of the plunger *guide*. While controlling the pressure with one hand on the mass end with the other end of the mass resting on the bench surface, you will be pulling and retracting the paper beneath the surface of the rotating plunger *guide* with the other hand.

NOTE

As always when polishing do not let the paper run dry of oil.
In this particular case keep the paper moving and you will
see that you can move the oil in the path of the *guide*.
If it appears that you are developing more scratches
reduce the pressure to the *guide*.

5.7.10.6.3. Get the small 4x1x1/4” aluminum mass, from the flat appliance kit. Cut four strips of 2/0 abrasive paper 6x1”. Place the mass on the workbench centered beneath the *guide*. Preset the drill rotation direction such that the bottom of the plunger *guide* is rotating away from you. Place a strip of the abrasive paper on the mass so that it is completely covered, with a couple inches left at the end nearest you. Apply a liberal coating of oil to the paper. Lock the drill on. Grasp the far end of the mass with one hand with the thumb and forefinger. Grasp the near end of the paper with the other hand. Rotate the far end of the mass upward to the rotating *guide* until light contact is made with the paper sandwiched between the mass and the *guide*. Keep the paper moving slowly on the mass, away, then toward you. Stop and replace the paper as required, inspect the surface of the *guide* frequently. When all of the scratches have been removed, disassemble the *guide* from the fixture and place it in glass container 3. Return the arbor assembly to the round appliance kit.

5.7.10.7. Get one of the *plungers*, plate E index 76. From the round appliance kit, get the orange/green heat shrink tube, it is about 5/8” long and 5/16” in diameter. This is a jacket to protect the *plunger* when it is installed into the drill chuck. Inspect the small pin of the plunger, it may have a strange wear pattern, sort of a flattening shelf on the top half of the shaft. This type of wear can not be entirely removed because to do so would reduce the diameter of the pin shaft too much. However you can sculpt the ledge. The second wear feature encountered is the flattening of the very end of the pin. Ideally it should be very gently rounded.

5.7.10.7.1. Insert the base of the *plunger* into the heat shrink jacket and secure it into the drill chuck. To reshape the pin end, get one of the “Swiss” files and use it as you would in the round polish technique. Take off as little metal as possible to round off the pin end. Do not ever use a coarse file to do this, it will cause deep irregularities that can not be polished out and you will shorten the life of the *plunger* by removing too much material.

5.7.10.7.2. From the flat appliance kit, get the black-handle hardwood plunger paddle (3x3/4x1/4”). Wrap a small piece of abrasive paper around one end and use it as an overlap to polish the small pin end of the *plunger.*

5.7.10.7.3. Remove the *plunger*; return the jacket and file. Get the 1/4", green length of wire insulation from the round appliance kit. Insert the pin end of the *plunger* into the insulation to serve as a jacket to protect the pin in the drill chuck. Secure the pin into the drill chuck. From the flat appliance kit get the black hardwood handle, wrap the end with a small piece of abrasive paper. Lock the drill on. Oil the paper and polish out any scratches on the barrel end of the *plunger*. When polished, repeat the polishing process for the pin and the barrel ends of the second *plunger*. Return the *plungers* to the glass container. Insure that there are no *actuator assembly* 3 components out loose on the bench.

5.7.10.7.4. You have completed the polishing of this actuator, place all of the components out of harms way.

5.7.10.7.5. Return to paragraph 5.7.10.1. and repeat all of the steps up to 5.7.10.7.3. to complete *actuator assembly* 2. Remember to substitute glass container 2 in the process to avoid co-mingling the components. After completing *actuator assembly* 2, proceed with the following steps.

CAUTION

Do **not** commingle parts between actuator assemblies #2 and #3. There are sufficient differences in wear patterns and dimensions to cause problems. As you complete "finishing" each component put it in the appropriate glass container.

5.8. Surface "finishing" critical surfaces involves the use of leather, or cloth and polishing compound. All of the surfaces that you have polished with abrasive paper will now be "finished" to a high luster. Clean up the work surface, especially the area around the electric drill where there might be metal particles and oil. Be sure that items you took from the flat and the round appliance kits are returned. Prepare a finished part layout area where you can safely position parts without causing scratches, layout a Texwipe towel for this purpose.

5.8.1. Get the surface finishing kit, the plastic envelopes containing assorted leather pieces and finishing cloths.

5.8.2. Get glass container 2 and the other parts that belong to *actuator* 2. You are going to surface finish all of the components of this actuator beginning with the *base*, plate E index 70.

5.8.2.1. From the surface finishing kit get the 1-1/8" dia leather wheel/shaft and secure it into the drill chuck. Use it to finish the inside ledge of the *base* lightly. Also finish the inside wall of the *base* lightly.

5.8.2.1.1. To achieve a final finish and brilliant luster, get a narrow cloth form the plastic bag labeled "final finish cloths". Cover the entire wheel, front and side surfaces, with some overlap. Wet the cloth lightly, and apply several drops of brown polishing compound from the 2x2" plastic container.

5.8.2.1.2. Press the *base* chamber up against the cloth-covered wheel, it should be a snug fit. While grasping the *base* very firmly operate the drill slowly at first, and push the chamber of the *base* onto the wheel and cloth. By pushing firmly you will finish the inner ledge of the *base*, by moving the *base* inward and outward you will finish the base chamber wall. When completed, place the *base* out of harms way close to #2 glass container.

5.8.2.2. Get the actuator *sleeve*, plate E index 78. Finish the inside chamber of this component using the same process that you used on the *base*.

5.8.2.2.1. From the surface finishing kit, get the 1-1/2" dia leather wheel/shaft fixture. Use the same cloth technique and polishing compound to finish the inside ledge of the *sleeve* and the top surface of the *base*. Set the *sleeve* and *base* out of harms way close to glass container #2.

5.8.2.3. Get the *bushing*, plate E index 71. Get the 8x2" leather piece. Finish the flat surface (two half moons) with the leather as you would in the flat polish technique. Finish the two walls of the keyway with the edge of the leather piece.

5.8.2.3.1. Get the 2" shaft with the square end and double shoulder, get some cotton. Secure he shaft into the drill chuck. Snug fit the *bushing* onto the square end of the shaft using the cotton as stuffing. Get a 3x1/2" leather strip, use a taffy stick for backing up the leather and finish the outside narrow surface and the adjacent 3/16" round surface of the *bushing*. Use a drop of polishing compound to enhance the finish. Put the bushing out of harms way with the other pieces of this actuator assembly.

5.8.2.4. Get the (centering) *guide*, plate E index 72. Finish the four sets of the key sidewalls using the large leather piece as in the flat polish method. Finish the four half moons the same way.

5.8.2.4.1. Get the 1-1/2" long bolt with the large hex head and the rectangular nut, assemble the *guide* into this fixture and secure it into the drill chuck.

5.8.2.4.2. Use a 3-1/2" leather strip and taffy stick to finish the outside surface of the *guide*. Use a drop of polishing compound to enhance the finish. Put the *guide* out of harms way with the other pieces of this actuator assembly.

5.8.2.5. Get the (plunger) *base*, plate E index 73. From the round appliance kit get the plastic envelope and the ½" long hex shaft with bolt and lock washer. Fasten the *base* to the hex shaft, and secure the assembly into the drill chuck. Get a narrow leather strip, and a taffy stick for backing. Finish the half moon walls, the adjacent large ring surface, and the outer surface of the disk. Use a drop or two of polishing compound as necessary to achieve a brilliant luster. To finish the large flat surface and the keyway walls, disassemble the base from the hex shaft. Get the 2" wide leather strip and use the flat polish technique and polishing compound. Return the arbor hardware. Place the *base* out of harms way.

5.8.2.6. Get the (plunger) *guide*, plate E index 77. From the round appliance kit, get the 1-1/2x3/16" aluminum shaft, secure the smooth end into the drill chuck. Attach some cotton to the scored end of the shaft in a mass slightly larger than the diameter of the ¼" plunger chambers. Place a couple drops of polishing compound on the cotton bulb. Operate the drill in a direction such that the cotton mass will tighten around the shaft, and press the plunger *guide* chamber over the cotton bulb, it should be a snug fit, if not spin on some more cotton. Remove the *guide*, the cotton mass is now

shaped. Apply a couple drops of polishing compound to the cotton and finish the chambers to a brilliant luster. Return the arbor.

5.8.2.6.1. From the round appliance kit, get the 1" gear that has a blue plastic spacer, and two hex head screws held in place by a white plastic keeper. Remove the keeper. Attach the *guide* to the fixture with the blue spacer in place. Secure the fixture to the drill chuck. Get a ½" leather strip and a taffy stick for backing. Apply a couple drops of polishing compound to the leather and finish the outside wall of the *guide* to a brilliant luster. Disassemble and return the fixture with the keeper in place. Place the *guide* out of harms way in the glass container.

5.8.2.7. Get one of the *plungers*, plate E index 76. From the round appliance kit get the orange/green heat shrink tube and install it over the *plunger* base. Secure it into the drill chuck. Get a ½" wide leather strip and a taffy stick for backing. Finish the pin end of the *plunger*; use a drop of polishing compound as required. Finishing the very tip of the pin is very important.

5.8.2.7.1. Get a ¼" green length of wire insulation from the round appliance kit. Place it over the pin end of the *plunger* and secure the pin end into the drill chuck. Using the same materials from the previous step, finish the outer cylinder wall of the *plunger*. Disassemble the pin when completed and return it to the glass container. Repeat steps 5.8.2.7. and 5.8.7.2.1. for the second pin.

5.8.3. Repeat steps 5.8.2. through 5.8.2.7.1. for actuator assembly #3. Remember that actuator assembly components must remain segregated.

5.8.4. Return all appliances back to their containers, and clear a work area about two feet wide and two feet deep. Do not commingle actuator components while doing so.

CAUTION

Do not clean any component on the decks with alcohol unless specified by this work instruction. General purpose oil is the only cleaning agent to be used for most parts.

5.9. Place an open Texwipe on the bench. Tear another Texwipe in half and separate the layers set them aside, you will be using them to clean components of the actuator assemblies in preparation for lubrication and reassembly.

NOTE

General-purpose oil will not be used as a lubricant for any surface on the transcriber decks. It is used only for cleaning purposes in specified locations.

5.9.1. Get a can of general-purpose oil. Get some cotton swabs (you can save on swab consumption by breaking off the dirty swab and spinning some cotton on from the cotton bag in the finishing kit).

5.9.2. Bring all of the actuator #2 components nearby. Gently clean all surfaces of each and every one of the actuator components by swabbing them with a swab saturated with general purpose oil, and wiping them dry with a piece of Texwipe towel that you have prepared. Pay particular attention to

all crevasses and inside corners and small holes that tend to gather polishing compound and other contaminates. Place the general-purpose oil out of reach.

5.10. Get the large aluminum plate mass; you will be using it as a base for heat treatment of some actuator parts.

5.10.1. Gently place the following actuator components close together on the mass:

- Actuator (base), plate E index70,
- Bushing, index 71,
- Guide (centering), index 72,
- Base (plunger), index 73,
- Sleeve, index 78,
- Guide (plunger), index77.

5.10.2. Get the container of Castrol-Syntec 5W-50 lubricant (this will be referred to as *C-S* oil for the remainder of this WI). This is the only wet lubricant that will be applied; many types have been tested on this equipment. Get or make, two clean cotton swabs. Saturate a swab with this lubricant.

5.10.3. Get the *actuator base*. Using the *C-S* oiled swab, coat the top round-flat surface, the inside wall of the large chamber, and the small flat surface adjacent to the inside chamber wall. Apply a liberal amount of oil to these surfaces. Put the base back on the mass with the large chamber opening facing up.

5.10.4. Get the *bushing*, grasp the shaft end. Apply oil to the keyway walls and all of the exterior surfaces except the shaft. Return it to the mass.

5.10.5. Get the centering *guide*; apply *C-S* oil to all of the surfaces except the center 3/8” hole. Return it to the mass.

5.10.6. Get the *base* (plunger), index 73. Apply the *C-S* oil to all of the surfaces and return it to the mass.

5.10.7. Get the *sleeve* (index 78). Apply the oil to the small chamber wall, the adjacent round-flat surface, and 1/8” of the large chamber wall adjacent to that. Return the *sleeve* to the mass.

5.10.8. Get the *guide* (plunger), index 77. Apply *C-S* oil only to the outside cylinder wall. Return the *guide* to the mass.

5.10.9. You are now going to heat treat these oiled parts, this has proven to be a very effective technique extending the time required between overhauls.

5.10.9.1. Get the heat gun; plug it in at a location where the cord will not interfere with components/tools, et cetera on the work surface. With the actuator components close together on the mass, heat all of the components evenly for approximately one half-hour. Be observant, should a white smoky vapor begin to arise from the components, that is your signal to back off with the heat. You want to keep the components hot but just below the vapor point. After one half hour of treatment, turn off the gun, place it out of harms way and take a break while the components cool off to room temperature, usually about twenty minutes.

5.10.9.2. Position your bare wrist above, not touching, the previously heated components to see if there is any heat left, if there isn't, test the surface of one lightly with your finger. When you have determined that the components are at room temperature, layout another clean Texwipe at a convenient location. Separate another Texwipe into pieces and wipe off all of the oil from the components you have heat-treated! This old oil is not useful now due to contamination. Place the wiped off components on the clean Texwipe. Wipe off the mass and place it out of the way.

NOTE

Dry lubricant is specified on certain surfaces.
Do not substitute any specified lubricant.

5.11. Prior to final lubrication and re-construction of the *actuator assembly*, it is necessary to apply a special dry lubricant to the *plungers* and to their chambers in the plunger *guide*.

5.11.1. From the round appliance kit, get the 1-1/2"x3/16" dia aluminum shaft, and secure the smooth end into the drill chuck. Attach some cotton to the scored end of the shaft and spin on a mass slightly larger than the diameter of the plunger chambers.

5.11.2. From the surface finishing kit, get the gray plastic container. It contains a dry powder lubricant, molybdenum disulfide (z-moly).

5.11.3. From the deck tool kit, get the plastic tube containing artist brushes and taffy sticks. Get an artist brush from the plastic tube, and dip it into the z-moly to pick up some of the z-moly powder. Apply this powder to the cotton mass on the drill shaft.

5.11.4. Get the (plunger) *guide*, plate E index 77. Clean out the two chambers with a cotton swab.

5.11.5. Operate the drill in a direction that causes the cotton mass to tighten around the shaft and press a plunger *guide* chamber over the cotton bulb, it should be a snug fit, if not spin on some more cotton and reapply some z-moly. When using z-moly powder, metal will take on a bluish appearance as it becomes coated with the lubricant. Look for this signal inside the first chamber and compare it to the unlubricated chamber. Lubricate both chambers. Wipe off any z-moly that may have collected on any other surface of the *guide*. Return the *guide* to the Texwipe when complete. Remove the cotton swab shaft from the drill and set it aside where it will not become contaminated.

5.11.6. Get one of the *plungers*, index 76. In the surface finishing kit, find the gray plastic envelope and get one of the black-colored lube cloths. Fold the cloth in half and deposit some z-moly in the center with an artist's brush. Rub the cylinder wall into the z-moly and coat the entire wall. Do the same for the other *plunger*.

5.11.7. Get the plunger *guide*, deposit a minute amount of z-moly in each chamber. Get the *plungers*, place them into the plunger *guide*. Get a wooden dowel that will fit into the cavity of the *plunger* and exercise each *plunger* inside the *guide* chamber.

5.12. Re-assembly of the actuator begins with the *plunger subassembly*. You already have the *plungers* installed in the plunger *guide*. Get the two *springs*, plate E index 75. Place the *springs* into the cavity of each *plunger* narrow end in first. Lift up the *guide* to eye level. Determine if the exposed ends of the *springs* are the same height with respect to the flat surface of the guide. If they are not, exchange the two *springs*. The correct *spring* exposure above the flat surface of the *guide* is approximately one spring winding.

5.12.1. Get the plunger base (plate E index 73). Get the two *screws*, index 74. Check the glass container to see if there was a shim on this unit, if so lay it on the fully flat side of the *base* with the three holes centered. Using the 3/32" hex driver, carefully attach the *guide*, with its contents, to the *base* flat surface (and shim if included) with the two screws. Insure that the *screws* are very tight. Wipe off this *plunger subassembly* with a piece of Texwipe.

5.12.2. Set the *plunger subassembly*, copper disk down, on a Texwipe. Exercise the *plunger* pins rapidly several times. They should release back up positively with a crisp snap when released from the down position. There should be no sense of scraping when depressed. Get the claw hammer, it weighs about one pound-one ounce. Grasp the hammer handle so that it is vertical and the hammerhead is hanging down. Gently rest the center of the head on one *plunger* pin. The pin should retract to approximately 1/32" from the top of the plunger *guide*. Check the other pin for this specification.

5.12.4. Measure the height of the *plunger* pin from the top surface of the plunger *guide*, it should be at least 3 mm high. If it is not disassemble the unit and rework another pin by polishing, finishing and lubrication and re-assembly.

5.12.5. Wipe off the *plunger* subassembly with a piece of clean Texwipe. Set the *plunger* subassembly on the Texwipe you reserved for this actuator assembly.

5.13. To accomplish final internal lubrication and re-assembly of the *actuator*, get the actuator *base*, and place it with square end down in front of you.

5.13.1. Get a clean cotton swab; saturate it with fresh C-S oil. Apply a light coating of oil to the narrow shelf at the interior bottom of the large chamber wall.

5.13.2. Get the small Teflon washer from the glass container. Gently clean it with general-purpose oil, and dry it off with a piece of Texwipe. Apply a very light coat of C-S oil to the washer and place it at on the small interior shelf of the actuator *base*.

5.13.3. Get the *bushing*, plate E index 71. Grasp the shaft end and apply a very light coat of C-S oil to the keyway walls and all of the exterior surfaces except the shaft. Place the *bushing* down into the chamber of the actuator *base* over the Teflon washer.

5.13.4. Get the centering *guide*. Look at the center surface of the keyway. You will notice an alpha letter etched on one end and a number 2 or Roman numeral II etched on the other end. The number(s) 2 indicates that this component belongs to *actuator assembly #2*. The alpha character is a key-to-keyway alignment code. This annotation also appears on all if the keys.

5.13.5. When assembling the internal components of the actuator assembly that involve keys and keyways; insure that the alpha codes are the same letter, and that they are on the same end of the

joined components. Also insure that all of the numbers match the actuator number being worked. This is a double check to insure that components are not commingled, and that the centering *guide* is seated in its worn-in position.

5.13.6. Apply very light coating of C-S oil to the flat surfaces of the centering *guide*, and a light coating of C-S oil to the exterior round surface. Match the alpha character ends and the number ends of the *guide* and the *bushing*, and place the guide onto the bushing.

5.13.7. Get one of the two large Teflon washers from the glass container. Gently clean it off with general-purpose oil and dry it with a piece of Texwipe. Apply a very light coat of C-S oil to it and place it on the top round surface of the actuator *base*.

5.13.8. Get the *plunger subassembly*. Apply a liberal coat of C-S oil to the exterior wall surface of the *guide*. Apply a light coat of C-S oil to all of the flat surfaces and the outside round surface of the plunger *base*. Match the alpha character ends and the number ends of the plunger *base* to the centering *guide*, and place the *plunger subassembly* on the centering *guide* over the Teflon washer.

5.13.9. Get the last large Teflon washer from the glass container. Gently clean it off with general-purpose oil and dry it with a piece of Texwipe. Apply a very light coat of C-S oil to it and place it on the exposed large flat surface of the plunger *base*.

5.13.10. Get the actuator *sleeve*. Apply a liberal coat of C-S oil to the small chamber wall, and the adjacent flat round ledge, including about 1/8” of the adjacent large chamber wall. Verify that the small aperture that accommodates the brake pin, plate E index 68 is clean and free of any deposits, if not clean it out. Assemble the *sleeve* over the *plunger assembly* to the actuator *base*.

5.13.11. While keeping the actuator assembly from coming apart, rotate the assembly so you can see the square end. Look for the word “pin” with an arrow etched into a surface. The arrow points to the location where the brake pin must be aligned. Twist the actuator *sleeve* on the actuator *base* until this occurs, and you will se that a pin hole near the bottom of the *sleeve* lines up over a pinhole in the actuator *base*. Rotate the unit and see that the other two pinholes are also in alignment. (This is another very good reason why components must not be commingled between actuator assemblies; the pins are situated differently between actuators two and three).

5.13.12. Get a set of tweezers (squeeze to open). Get a roll *pin*, Plate E index 69 from the glass container. Gently place the actuator assembly on its side, check to see that the pinholes of the *sleeve* still match the *base*, and that the arrow still points to the brakepin. Get a ball peen hammer and lightly tap the roll *pin* into one of the pinholes. Recess the *pin* about 1/32” below the surface of the outside wall. Install the second *pin* the same way.

5.13.13. Place the actuator #2 out of harms way. Go back to step 5.9 and repeat all of the steps for actuator assembly #3, then proceed with the following steps. The actuators will not be reinstalled until much later in this work instruction.

5.14. You will now surface finish the cassette *retainer* assembly, Recall that “finishing” requires achieving a high luster. Open a new Texwipe towel and lay it out nearby to place finished parts on.

5.14.1. Get the cassette *retainer* (figure 5-11, sheet 1 index 38).

5.14.2. Get the 1” dia leather wheel and install it into the drill chuck. Put a couple drops of polishing compound on the wheel. Finish all surfaces of the cassette *retainer* with this wheel. Pay particular attention to the bottom surface and the front and trailing corners of the bottom surface. You will notice that the edges are rounded off, this is an intentional modification, retain this feature.

5.14.3. Get the retainer *plate* (index 40). Finish it the same way as you did the *retainer*. Stress the underside surface for about 3/8” along the full distance of the slot, where the *guide* (plate C index 42 travels). Afterward, change the leather wheel to the 1-1/2” dia wheel. Carefully finish the inside walls of the slot, one side at a time. Take care not to allow an opposite sidewall to come in contact with the metal backing disk of the leather wheel!

5.14.4. Get the *guide (*plate C index 42). Finish all four surfaces that normally face the retainer *plate* when installed, the same way you finished the *plate*. Note that the end corners of all four surfaces are slightly rounded, retain this feature.

5.15. Get an artist paintbrush, and a squared off polishing taffy stick from the plastic tube in the deck tool kit box. Also get the z-moly container and the cassette *retainer* (index 38).

5.15.1. Apply a small amount of z-moly powder with the brush to the under surface of the *retainer* on either side of the keyway. With the taffy stick rub the powder into the surface of the *retainer*. Continue until you notice a slight bluing tint appear on the surface. Place the *retainer* on the Texwipe you prepared earlier for this purpose with the lubricated side up.

5.15.2. Get the retainer *plate*. Lubricate the top surface, the bottom surface about 3/8 “ along the full distance of the slot, and the inside walls of the slot the same way you lubricated the retainer.

5.15.3. Get the *guide*. Lubricate all four surfaces that normally face the retainer plate when installed, the same way you lubricated the retainer.

5.16. Get the two short Philips head screws that have the tops flattened, and the star washers (if they were there originally). Get the *guide*, the *plate* and the *retainer*. Note that the *guide* and the *retainer* are etched with a letter. Assemble the *guide* through the *plate* to the *retainer*, orient it so that the letters are at the same end, and the *retainer* is pointing to the end of the slot with the narrow front wall. Be sure that the screws are tight.

5.16.1. Apply more z-moly to the slot sidewall. Operate the guide so that it rests over the z-moly deposit, and exercise the guide so that it squeezes the z-moly against the wall of the slot. Repeat this for the other sidewall and for the other facing surfaces. The objective of this is to deposit additional lubricant along the entire path of the assembly, you will see a series of caked deposits. Repeat this process for the surfaces between the guide and the top of the plate.

5.17. To reinstall the *cassette retainer* assembly, get the deck and place it in front of you right side up. Clean out the slotted area that normally accommodates the cassette retainer assembly. Insure that the original shims are still in place; remove any temporary tape you may have installed. Insure that the screw holes are not obstructed by the shims. Refer to figure 5-11 sheet 1 as required for installation.

5.17.1. Get the *spring pin* and the *washer*. Place the *washer* on the *spring pin*. Get the *spring* and slide it onto the *spring pin* all the way down to the *washer*.

5.17.2. Get the rest of the *cassette retainer assembly*. Insert the free end of the spring-loaded pin into the *guide* from the end of the assembly that has the wide end-stop.

5.17.3. Slightly compress the loaded *spring* pin. Place this assembly into the slot with the narrow end-stop of the plate at the front of the deck. Inspect the mounting holes to be sure that the shims are still in place and that the threaded holes are accessible.

5.17.4. Get the mounting screws and start them into the threads. If there is an alignment etch across the wide end-stop of the plate and a corresponding etch on the deck surface, align them. Otherwise center the plate in the slotted areas and tighten the screws firmly.

5.18. You will now finish the components of the *cassette latch assembly*. Get the cassette latch *housing*. Refer to attachment 3, figure 1.

5.18.1. Get a 3-1/2”L x 7/32”dia bamboo dowel from the round appliance kit and a 3’ x 1-1/2” piece of finishing cloth. Install the dowel into the drill chuck, and tape the narrow end of the cloth onto the dowel. Operate the drill slowly so that the cloth tightens on the dowel.

5.18.2. Test the fit of the polishing appliance into the 9/32” hole on the front end of the cassette latch *housing.* Shorten the cloth if it is too tight. Lightly wet the cloth and apply some polishing compound to it. Finish the inside if this chamber.

5.18.3. Replace the dowel with a 2-1/2” x 9/32” dia steel shaft. Tape the narrow side of a polishing cloth about 2” x 1” to the shaft. Test the fit into the large top hole of the *housing* and finish this chamber the same way as the previous one.

5.18.4. Get the large leather piece (2” x 8”). Finish the lower front surface of the *housing* beneath the 9/32” dia hole.

5.18.5. Clean out the two chambers with a clean cotton swab, and put the *housing* on the Texwipe towel.

5.18.6. Get the cassette latch *lever*. From the deck tool kit get the plywood latch assembly-finishing block. Get a leather strip that will cover a portion of the narrow side of the block. Straddle the *lever* over the leather and block and finish the worn end of the *lever*. Put the *lever* on the Texwipe towel.

5.18.6. Get the *trigger pin*, index 3. Get a wooden dowel that fits snugly into the large opening of the *trigger pin*. Use a bit of cotton as a wedge if additional tightness is required. Install the dowel into the

drill chuck. Get a ½" wide piece of leather, apply a couple drops of polishing compound to it. Operate the drill while lightly pinching the leather around the *trigger pin*. After finishing it to a high luster, place the *pin* near the housing on the Texwipe. Remove the shaft from the drill.

5.18.7. Get the *latching cylinder*, index 4. Get a wooden dowel that fits snugly into the large opening. Install the dowel into the drill chuck and the *cylinder* onto the dowel, use cotton to snug it up as required. Finish this piece the same way you finished the previous part.

5.18.8. Install the thick 1" dia leather wheel into the drill chuck. Finish all edges at the concave end of the *latching cylinder.* When complete place it on the Texwipe.

5.19. Lubricate the *cassette latch assembly* beginning with the *housing*. Get the cassette latch *housing*, the 7/32" dia bamboo dowel and some cotton. Install the dowel into the drill chuck. Spin enough cotton onto the end of the dowel so that you will have a moderately snug fit between the 9/32" dia (small) hole and the full depth of the *housing* chamber. With an artist brush apply some z-moly to the cotton, and the inside of the chamber. Operate the drill and press the *housing* chamber onto the z-moly swab. Take care not to generate any heat which could cause the z-moly to break down.

5.19.1. Replace the bamboo dowel with the 2-1/2"L x 9/32" dia steel shaft. Install the smooth end into the drill chuck. Spin enough cotton onto the scored end for a moderately snug fit into the large hole of the *housing* for the entire depth of the chamber. Apply z-moly to the cotton and the inside of the chamber. Operate the drill and press the *housing* chamber onto the swab. Take care not to generate any heat which could cause the z-moly to break down.

5.19.2. Lubricate the *trigger pin* and the *latching cylinder* using the same dowels as arbors that you used for finishing. Get a z-moly lubricating cloth, apply some z-moly to it. Operate the drill and pinch the cloth around the cylinder(s) to achieve a bluish tint for each part. Place the parts on the Texwipe when finished.

5.19.3. Get the *lever*, the cassette latch finishing block and a z-moly cloth. Apply some z-moly to the lower inside worn surface of the lever. Wrap the cloth around the end of the block and work the z-moly into the worn surface. Place the *lever* on the Texwipe when finished.

5.19.4. Get the *housing*. Using the same appliances from the lever, lubricate the front worn surface below the 9/32" hole. Put the lubricating appliances out of the way.

CAUTION

Read each of the subparagraphs in section 5.20
before proceeding. There are spring loaded
components that will be hurled to the netherworld
if released prematurely. You have been warned.

5.20. To reassemble the cassette-latching device, first apply a small amount of z-moly into the *latching cylinder* chamber. Drop the 3/16" dia *spring* into the chamber, and position the *latching cylinder* into the chamber around the *spring*. With a wooden dowel, gently , exercise the cylinder back and forth in the chamber to work in the added z-moly lubricant, slowly release the dowel before removing it.

5.20.1. Get the 1/8" pin punch, and a short wooden dowel, about two inches long. Manipulate the cylinder so the curved ledge of the cylinder is closest to the large cylinder hole on the top of the housing (the long rectangular flat surface).

5.20.1.1. With the wooden dowel, push and hold, the *latching cylinder* into the *housing* until the pinhole of the *latching cylinder* is visible in the elongated slot on the top of the *housing*, and you can see clear through the device.

5.20.1.2. Place the pin punch through the hole in the *latching cylinde*r and through the *housing* to keep the *latching cylinder* from launching across the room.

5.20.1.3. Place the wooden dowel down into the large *trigger pin* chamber to lock the *latching cylinder* in place. Remove the pin punch, the pinhole in the latching cylinder should still be visible in the slot of the *housing*.

5.20.1.4. Secure the *housing* into the vise along its narrow width and the elongated slot on top. Get a light ball peen hammer. Get the 7/16" *pin* that you previously removed from the assembly. Place the beveled end of the *pin* into the pinhole of the *latching cylinder* and gently tap the pin into the pinhole until 5/32" remains above the top surface of the *housing*. Remove the wooden dowel.

5.20.2. Get the *spring guide* (index 9). Operate the *latching cylinder* back to expose the *trigger pin* chamber. With the small pin end down, drop the *spring guide* into the *trigger pin* chamber.

5.20.2.1. Get the *trigger spring* (index 6). Operate the *latching cylinder* again and drop the *trigger spring* into the chamber over the *spring guide*.

5.20.2.2. Get the *trigger pin* (index 3). Orient the flat surface of the conical top so the flat face is toward the curved ledge of the *latching cylinder*. Operate the *latching cylinder* once again, and drop the *trigger pin* over the *trigger spring*. While holding the *latching cylinder* fully open, depress the *trigger pin* all the way down then release the *latching cylinder*. If you reassembled this component correctly, the *trigger pin* is now latched fully down. Do not operate the latching cylinder again until so instructed.

5.20.3. Remove the *housing* from the vise. Remove one soft jaw. You are going to "pre-seat" the *guide pin* into one side of the *lever*. Get the *lever* (index 2), and *guide-pin* (index 8). Place the *lever* in the vise against the soft jaw so that the pinhole will be covered and the ¼" lip is not within the vise jaws. Open the vise wide enough so that the *guide-pin* will fit between the bare jaw of the vise and one hole of the *lever*. Slowly tighten the vise with the pin in the pinhole until the *guide-pin* is flush to the inside wall of the lever and not entering the channel inside the *lever*.

5.20.3.1. Get the *housing*. Position the front end (trigger pin end) into the *lever* channel. While watching the *pin* advance toward the pinhole of the *guide-pin*, slowly tighten the vise until it is seated all the way through the opposite *lever* wall.

5.20.4. Exercise the *lever*, being careful not to allow the bottom edge of it to ride the front wall of the *housing*. The *latching cylinder* should snap forward briskly, preventing the *trigger pin* from returning upward. Exercise the *stop pin* away from the *trigger pin*. The *trigger pin* should snap upward briskly.

NOTE

Grease and wet other wet lubricants are applied to very few and only specified surfaces.

5.20.4.1. Get the lube kit from location C3-2-D. Take out the tube of Molykote. From the deck tool kit, get the tube containing artist rushes. Take out the artist brush with the blue heat shrink cap. Apply a 1/8" dia drop of Molykote to the artist brush. Get the cassette latch assembly, and position it with the visible trigger pin and the stop pin downward. Lean the lever away from the front surface of the housing. Apply and smear the Molykote to the worn end of the lever where it would contact the front wall of the *housing* in operation. Get the container of Z-moly powder, and with the same brush apply it to the housing also. Return this "grease" brush to its blue sheath and into the tube.

5.20.4.2. Gently operate the *trigger pin* /stop pin to allow a transfer of the Molykote to the front wall of the *housing*.

5.20.4.3. Turn over the assembly, exercise and hold the stop pin to the rear of the assembly. Using an uncovered artist brush, sprinkle some z-moly powder into the *trigger pin* chamber and into the *guide pin* slots of the *housing*. Exercise the assembly to work in as much of the lubricant as possible. Lightly tap the assembly onto the bench over a piece of Texwipe to remove any excess z-moly.

5.21. Get the two hex head screws and their lock washers used to secure the assembly to the deck. Should the screws have to be substituted, insure that the threaded shaft does not exceed 5/16" in length to avoid impinging upon the latching cylinder, lock washers must be used.

5.21.1. Get the deck, place the *latch assembly* into the notch on the deck, and install the assembly with the screws and lock-washers. Be sure that the assembly is centered along the long length of the notch. If the top rear of the assembly is etched with a line and the deck is etched with a line, match them for positioning. If not, position the assembly fully toward the center of the deck. Tighten the mounting screws firmly.

NOTE

The following instructions will also be applied to any new spring mechanism assemblies prior to installation.

5.22. Place the deck in its normal orientation in front of you. Reference figure 5-11, sheet 1, indexes 8 and 9, you will find the two *spring mechanism assemblies*. At one time, these were high failure items. They were not intended to be reparable in the field. With this procedure however, they are repaired and now they rarely fail. For your reference in the following steps see attachment 4, figure 2.

NOTE

The set costs close to $900. The reason for failure was insufficient surface finishing, sharp corners at the barrel ends of the plungers, and improper lubrication.

5.22.1. Test the *spring mechanism assemblies* by depressing the *plunger* to the fully retracted position, feel for rough spots along the path of movement. Release the *plunger*. It should briskly snap out to the fully extended position.

5.22.2. If an assembly fails the test or is unsatisfactory, get an X-acto knife and scribe the outline of the foot of the *spring mechanism* onto the deck surface, be as precise as possible. Remove the faulty *spring mechanism* from the deck; place all removed parts into one of the glass containers. Work only one *spring mechanism* at a time to avoid commingling of parts.

5.22.3. Begin disassembly by securing the mounting "foot" and most of the vertical pillar of the *housing* into the vise with the "foot" pointing downward and the plunger barrel next to the outside edge of the jaws. This will expose the end of the roll pin.

CAUTION

In the following steps do not remove the pin punch until so instructed, this component is spring-loaded and will launch parts.

5.22.3.1. Get the 1/16" pin punch. Place a glass container next to the vise. Rotate the vise so that when you drive out the *roll pin* it falls into the glass container.

5.22.3.2. Get a light ball peen hammer and gently tap the *roll pin* out of the assembly, leave the pin punch in the hole.

5.22.3.3. Move the glass container out of the way. Place and keep a finger in contact with the *spring guide* as you remove the pin punch. The relaxed length of the *spring* that loads the *spring guide* is three inches. Slowly allow the *spring guide* to release out from the *housing* chamber until there is no *spring* tension left.

5.22.3.4. Remove the *spring guide*, the *spring*, and the *plunger* from the *housing*. Place them into the glass container.

5.22.4. The reason for a *plunger* not depressing smoothly was pointed out in a previous note. Clean out the *housing* plunger chamber and inspect it for scoring or concentric machining grooves.

5.22.4.1. To remove these problems, get the metal shaft from the round kit that is 2-3/4" long and 1/8" in diameter that has a slightly pointed end. Install the blunt end into the drill chuck so that it bottoms out. Cut a piece of polishing paper 1-1/4" x 3", and tape one end of it to the shaft, operate the drill and wrap the paper tight. Place a couple drops of general-purpose oil to the paper and polish the chamber.

5.22.4.2. To finish the chamber, remove the polishing paper from the shaft and spin some cotton onto it so that it forms a snug fit for the length of the chamber. Add a couple drops of polishing compound, and finish the chamber to a brilliant luster.

5.22.4.3. To lubricate the chamber, replace the finishing cotton with fresh cotton and sprinkle some z-moly along the full length of it and lubricate it with the drill/ shaft. When complete place the *housing* out of harms way.

5.22.5. To polish the *plunger*, get the 2” long wooden dowel that is 3/16” diameter and has a slit it one end. Install the solid end into the drill chuck. Press the *plunger* onto the split end of the shaft firmly, use some cotton on the shaft if necessary to get a snug fit.

5.22.5.1. On one end of the *plunger* there are two ridges. Each ridge has two edges. These edges must be rounded off to a very small radius, just enough so that they do not present a sharp edge to the wall of the chamber when moving. To do this, get the white and blue plastic paddle, about 3-1/2” long x 3/8’’ wide from the flat kit. Cut a piece of polishing paper about 1” square, and put a sharp crease in it. Place the crease over the beveled edge of the paddle, smear a little oil on to the edge of the crease. Use this paddle to lightly round off the four ridges.

5.22.5.2. Get the black handle wooden plunger paddle from the flat kit, wrap it with polishing paper, oil the paper and polish out any scratches on the shaft of the *plunger*. Dry off the *plunger* when finished polishing.

5.22.5.3. Get a ½” wide strip of leather and the polishing compound. Finish the entire *plunger* to a high luster.

5.22.5.4. To lubricate the *plunger* get a z-moly lube cloth from the bag in the surface finishing kit. Sprinkle some z-moly on the cloth, lightly pinch the cloth around the *plunger* and operate the drill.

5.22.6. To reassemble the *spring mechanism assembly*, get the *housing*. Sprinkle a small amount of z-moly into the *plunger* chamber. Carefully install the *housing* into the vise as you did before.

CAUTION

Read the following three steps completely before doing them, the assembly is spring-loaded.

5.22.6.1. Get the roll *pin*, hold it with a pair of hemostats or needle nose pliers. Gently pre-seat the *pin* into one wall of the housing with a light ball peen hammer. Do not allow the *pin* to penetrate into the chamber.

5.22.6.2. Insert the *plunger* into the chamber. Insert the *spring* into the chamber. Insert the *spring guide* into the free end of the *spring* and hold it there. Rotate the *spring guide* so the pinhole will be in alignment with the pinhole of the *housing* when you seat it.

5.22.6.3. Carefully push the *spring guide* into the chamber until it is fully seated into the *housing*. Maintain the alignment of the *spring guide* pinhole and the roll *pin*. Keep manual pressure on the *spring guide*. Gently tap the roll *pin* into the *housing* until it is flush to the surface.

5.22.6.4. Remove the assembly from the vise. Exercise the *plunger* in and out of the chamber with the *plunger* rotated several times, you may add additional z-moly into the chamber by leaning the *plunger* to one side of the chamber opening.

5.22.7. To install the *spring mechanism assembly*(s) get a couple cassettes from the technician shelf of the Lektriever in the transcription area. Select the cassettes that have been opened before that is, the flat cover plate has been removed and reinstalled.

5.22.7.1. Annotate the cassette covers with the cassette serial number so that they can be reinstalled after this operation. Remove the covers and set them aside.

5.22.7.2. Place the deck in front of you, topside up. Install the *spring mechanism* snugly but not tight (the "toe" end of the housing "foot" points to the midline of the deck). Position the housing within the scribed area that you generated when you removed it.

NOTE

There is a rather large variance of cassette dimensions due to handling and wear which reduces the following steps to an empirical method rather than a fixed dimensional procedure.

5.22.7.3. Insure that the *trigger pin* of the *cassette latch assembly* is down, if not operate the *lever* to lock it down. Install the first cassette onto the deck. Note the amount of clearance between the spring mechanism *plunger* barrel and the entire surface of the concave slots on the cassette. Eject the cassette. Reinstall that same cassette into two decks on operational R/T equipment and note the clearance again. Adjust the mounting position of the spring mechanism on the in-process deck if required, to duplicate the clearance on the in-service decks. Repeat the comparison process with the second cassette but begin with the in-service decks. You may have to repeat the process until you have achieved the best quality of fit, tighten the *spring mechanism* firmly when finished. Remove the cassette and set it aside for now.

5.23. Located near connector J2 is an *alignment block* (figure 5-11, index 21). At this position, the M2 side of the deck, it is referred to as the M2 alignment block. If it is not etched with a "2" on the top surface, get the engraver and mark it now. Then mark the other one with a "3". Install a cassette into the deck and observe the action between the *alignment block* and the cassette rollers. The innermost set of rollers will not "seat" into the block in this test, but you can see their relationship. Remove the cassette in preparation for a "dressing" process of the blocks.

5.23.1. Carefully remove *alignment block* 3, take care not to stress the wires and wire clamp, and not to score the rubber capstan. Remove alignment block 2.

5.23.2. Clean the two *alignment blocks* with alcohol and a cotton swab and a piece of Texwipe. Clean the deck surface where they were formerly mounted.

5.23.3. Observe that there are two sets of forks on each *alignment block*. The top set will show a different wear pattern than the bottom set of forks. You may want to exercise the *alignment block* into one of the cassettes to get a better picture of the seating process. Note the differences between the two sets of forks as well as the cassette roller assembly. Place the cassette aside for now.

5.23.3.1. Look at the underside surface of the top set of forks. You will most likely find a circular wear pattern about 5/16" diameter. This is caused by the rollers on some cassettes having an imbalance of pressure from the springs that position the rollers. To reduce the drag on the rollers, should they contact this roughened surface, get a taffy stick. Get a file, and shape one end of a taffy stick to a convex paddle. Wrap the convex end with a piece of polishing paper and polish out the wear pattern.

Some grooves may be really deep and can be ignored, just try to restore some degree of smoothness to this surface without removing too much material. If you find any other rough edges on the top set of forks remove them with polishing paper. Do not do any thing that will change the dimensions of the **inside diameter** or **depth** within the center half of the fork.

5.23.3.2. Clean the surfaces you have polished with a cotton swab and alcohol. Get the convex paddle and sprinkle some z-moly on it and work the z-moly into the surface.

5.23.3.3. The bottom set of forks presents a totally different wear pattern and corrective action. Observe that the surface between the tines of each fork is "v" shaped, as opposed to the flat inside wall of the top set of forks. This "v" shape locks into a corresponding notch on the shaft of a cassette roller axle. Do not do anything that will change the dimensions of the inside diameter, depth, or "v" within the center half of the fork.

5.23.3.4. At the very end of the tines of each fork you my find a minute "ledge" forming. Look at the side profile of the tine. If the very end of the tine has not been rounded, get a "Swiss" file and gently round it off. Also, removing as little material as possible, carefully file off the ledge. Polish the filed surfaces with the taffy stick and polishing paper. Check the alignment block for fit with the cassette. Repeat the entire dressing process for the other alignment block. Do not reinstall the alignment blocks yet, set them out of harms way.

5.24. There are four tape guide assemblies on a deck (plate A, indexes 11, 16, and 14, at two places, located on each side of the head, index 19). They may require polishing and finishing. Do not remove the two outermost guides.

CAUTION

Extreme care must be taken when working with
or near items 11 and 16 because they have very
fragile electrical contacts that are difficult to repair.

5.24.1. The *tape guides* are basically non-moving cylinders with two ledges or rims, similar to a cotton thread spool. The two rims keep the tape at a certain height for the read head. Wear on the tape guides appears as three types of defects. There may be a flattening on the cylinder face created by the passing tape over time. There will probably be a series of hairline grooves cut into the ledges at the intersection with the cylinder (caused by certain cartridge defects). There may be dimples developing on the cylinder wall adjacent to the ledges. Inspect the four *tape guides* for these defects with a magnifying glass.

5.24.2. The first defect to correct on any of the *tape guides* is the flattening of the cylinder face. Doing so may also reduce the dimple effect. Get a fresh sheet of polishing paper. Line the backside of the paper with scotch tape along the narrow width of the sheet for about three inches. The purpose of the scotch tape is to provide a reinforcing backing to the paper.

NOTE

Read the next two instructions completely.
After you understand them, proceed.

5.24.2.1. To polish a *tape guide* face, you will fabricate some polishing belts. From the deck tool kit, get the black plastic *edge guide* (it is about eight inches long). Observe that the *edge guide* is identified with a “blade” edge next to a “back stop” surface. Take the *edge guide* and the reinforced paper to the paper cutter. Raise the cutting blade; make sure that it will stay up on its own, or have someone hold it up.

5.24.2.2. Place the polishing paper face down with the scotched end toward the stationary cutting blade. Place the *edge guide* “blade” flush up against the edge of the stationary cutting blade. Keeping your fingers clear of the two blades, slide then hold the paper up against the “back stop” of the *edge guide*. Remove the *edge guide* and cut the paper. This should result in a reinforced strip or, “polishing-belt” approximately 7/16” wide. Repeat the process until you run out of reinforced paper. Make sure that all of the strips are less than ½” wide, preferably 7/16”.

5.24.2.3. Bring all of the materials back to the workbench. Return the *edge guide* to the deck tool kit. Place the deck near the edge of the workbench with the head connector end facing you. Tilt it back toward you with the bottom edge of the deck resting close to the edge of the workbench.

5.24.3. Get one of the polishing belts you fabricated. Apply only one drop of oil to the middle of the belt and smear it along the belt. This is one of the few cases where such a small amount of oil is to be used. This is because the two outside *tape guides*, which also function as detectors, are composed of four segments separated by extremely thin insulators. Too much oil could result in transfer of contamination to the insulators.

5.24.3.1. If the outside *tape guide* had a defective front face or dimples, carefully wrap one of the polishing belts around the front face of the *guide*. Take note of the obstructions: any wires or edges that might restrict the movement of the belt. (To work the M2 guide you will have to temporarily remove the head connector flange. Do so carefully to avoid damage to any wires.) Tape down any loose wires that might be pulled or abraded. Remember to avoid the wire connections on the back of the guides, they have been epoxied in place but they are still vulnerable.

5.24.3.2. Polish the front face of the *guide* by operating the belt, as you would use a shoe shine cloth. Do not use excessive pressure, keep the polishing belt as close as possible to the rims but not touching them, speed is not important. Inspect the surface frequently.

5.24.3.3. After you have polished out the front face defects, clean the *tape guide* thoroughly with an alcohol soaked cotton swab. From the polishing kit, get a polyester strip of cloth out of the tape guide bag. Fold it along its length and smear some white polishing compound on it near the center. Finish the barrel face that you polished until you achieve a brilliant luster.

5.24.3.4. To polish out hairline grooves from the upper and lower ledges of the *tape guides*, get a seven-inch length of string from the polishing kit. In the middle of the string smear some yellow polishing compound. Wrap the string around the front face of the tape guide. Using your forefingers, keep string pressure down on the surface of the ledge, and try to avoid pressure toward the face of the *tape guide*. You will not be able to remove all of the grooves, but this technique will remove some, and at least “dull-off” sharp edges of the grooves. If you tried to remove all of the grooves, the resultant dimensional change could render the guide useless.

5.24.3.5. Get a clean cotton swab soaked in alcohol and clean the *tape guide*. If the other outside *tape guide* requires polishing, repeat the appropriate above steps.

5.24.3.6. Get the hand held DVM. Check for shorts between all four segments of each of the *tape guides* in turn, there should be none.

5.24.4. Thankfully it is much easier to polish the two inside *tape guides*, because they can be removed from the deck. You will work one at a time because the one on the M3 side of the deck might be a modified variety. Note the position of the flat side of the guide before removal. They are usually canted with respect to the head. Note the position of the base of the *tape guide* with respect to the etched lines on the surface of the deck. Note the position of the face with respect to the flat side of the tape guide that needs work.

5.24.4.1. To remove the inside *tape guides* you need two Phillips head screwdrivers. Remove the M3 *tape guide* and work it first. Install the two flat surfaces at the base of the *guide* into one corner of the vise so that the face you need to work and the bottom ledge you need to work are unobstructed.

5.24.4.2. Use the same basic methods to polish and finish this *guide* as you used for the outer *guides*. When completed, reinstall the *tape guide* using the positions you previously noted. Repeat the process for the guide on the M2 side of the deck.

5.24.4.3. If there are any unused tape guide polishing belts left, look inside the deck tool kit for a ¾" paper clamp with a label reading "tape guides only". Clip the belts together in that clamp for future use. Return all of the other items you used for the roller guides and tape guides to their containers.

5.25. Inspect the rubber surface of the *capstans* (plate A index 35 and 36) closely for cuts. The cuts usually appear near the top 1/8" of the rubber. If a *capstan* is cut it cannot be used and must be removed and a replacement found that matches precisely the outside diameter of the rubber. Or you can assemble a good capstan/base from the salvage box. But both *capstans* must have the same outside diameter.

NOTE

A set of *capstans* costs in excess of $500. Luckily, previous technicians have saved many *capstans* that they have removed. Now by grading and limited repair we can reclaim some, reducing overhead for this costly aircraft data collection system.

5.25.1. Get the digital vernier caliper. Carefully measure the outside diameter of the *capstans*. The *capstans* may show a wear pattern with the upper 1/8" and the lower 1/16" with a larger outside diameter than the middle ½". It is this middle surface that contacts the tape and is the area of interest.

5.25.2. The minimum outside diameter is .735" for the transcriber decks, .725" for the tester decks, and .695" for the rewinders.

5.25.2.1. If the deck is going to "spare rotation" open up a DDForm 1574 for the deck. In the remarks section annotate the O.D. measurement if it is greater than .695". If the O.D. is .695" or less the *capstans* must be replaced.

5.25.2.2. If the deck is to be installed into a specific machine, select or using the following steps, make a set of replacement *capstans* with a diameter appropriate to the machine application (above) from the reclamation box. If there are none left that meet required dimensions then select a set from the supply cabinet.

5.25.2.3. Check the endplay of the *capstans* by grasping the metal base with one hand and the rubber spool with the other hand. Gently try pulling and pushing the rubber end into and out of the base. There should be no movement.

5.25.2.4. Obviously, the *capstan* should rotate freely in the base. Hold the base and spin the capstan. A slight noise in the bearing does not always render the *capstan* useless, frequently only lubrication is required. If however, there is a definite vibration then bearing or the base/bearing set replacement is necessary. To correct any of these defects then disassembly of the capstans is necessary.

NOTE

Remember to place very small
parts removed into a container.

5.25.3. To remove the capstans for repair or replacement from the deck, remove the attached pulleys first. Get the shop ¼" socket drive, and the ¼" hex key from the deck tool kit (the gray rubber capstans need the ¼" wide flat blade screwdriver instead of the hex key). Hold the capstan fast with the hex key, and remove the ¼" locknut from the shaft. The complex looking pulley on the M2 side of the deck is also the clutch; it will lift off easily. The dark gray pulley on the M3 side of the deck is a very tight fit. Get two flatblade screwdrivers and simultaneously, at 180-degree separation, in steps, lever the pulley off of the shaft. Take care not to distort the pulley or scratch the belt face. Set the pulleys out of harms way.

5.25.3.1. To remove a capstan get the 7/64" hex driver from the deck tool kit. This driver has white paint stripes on the handle, make sure you return it to the deck tool kit when finished. Remove the three hex head-mounting screws. Remove the capstan and the ¼" thick shims from the deck.

5.25.4. To salvage a *bearing* or to reinstall a good *capstan* shaft into a *base* with good bearings, or to just lubricate a set of bearings you will have some disassembly to do.

NOTE

You will be working with extremely small precision parts.
Cleanliness of the work area and tools is required, take
appropriate measures to avoid parts contamination.
Read the following three steps completely before proceeding.

5.25.4.1. If this is your first attempt or if you feel you need practice, get the *capstan*, with the yellow label wrapped around it at the center of the base, that says "practice" from the capstan reclamation box. Attachment 5, figure 3 is provided for your reference.

5.25.4.2. Stand the *capstan* on the rubber end. Get the snap ring removal tool, Vaco size 1, "squeeze to close", and remove the *snap ring*.

5.25.4.3. Next you may find one or two *shim* washers on the shaft. They are very thin and fragile. Carefully remove the *shim* washer(s). An Exacto knife, possibly two of them, will help to manipulate them. Note the *quantity* so you can reinstall them later.

CAUTION

Read the next three steps completely before completing them.
The *split ring retainer* referred to is also an expansion
spring of very small gauge that will launch across the room.

5.25.4.4. Looking down at the base of the *capstan*, at about 3/8" inward from the outermost edge of the base, look for an incomplete circle with a space of about 1/8" between the ends. This circle is only about 1/64" wide and may be difficult to see. This barely visible piece of metal is an expanding *split ring retainer.* In the next steps your thumb will prevent it from jumping off into the netherworld.

5.25.4.5. This may take some practice, so be patient. Get an Exacto knife with a sharp point blade. Holding it tilted about 30 degrees from the vertical, place the point of the knife firmly, about 1/64" from one end of the *split ring retainer*, at precisely where it disappears under the ledge. Place and hold your thumb of the other hand firmly on the *base* and pressing up against the *axle*. While pressing the knife firmly, twist the knife on its axis to "walk" the end of the *split ring retainer* towards the center of the *base* until the knife blade "snaps" down in between the *split ring retainer* and the ledge that was hiding it. Hold the knife there.

5.25.4.6. With the knife and your thumb still in place and the end of the *split ring retainer* fully exposed, drag the knife in a direction that will cause the *split ring retainer* to completely release out from under the ledge. Remove and protect it.

5.25.4.7. Remove and protect the *seal disk* that was locked in place by the *split ring retainer*. This exposes the bearings and the raceway.

5.25.4.8. To extract the *capstan/shaft* from the *base*, place the *capstan*, rubber end down, in the vise so that the mounting flange straddles the jaws completely and the rubber would not touch the vise screw shaft when driven out of the *base*. Get the large plastic mallet and gently drive the *shaft* out of the *base*, you will also need the silver handle pin punch to complete this step. Remove and protect any *shim* washers that may be present next to the capstan.

5.25.4.9. The previous extraction step can:

- leave both bearings in the base,
- leave only the large (lower) bearing in the base,
- leave the small bearing on the shaft but pulled away from the rubber capstan.

5.25.4.10. Usually both bearings stay with the base. If both are good but the capstan rubber was bad, disassemble a capstan with bad bearings but a good rubber of the required dimension. Some of the parts in the reclamation box have the O.D. measurement written in black ink on the metal for your convenience.

5.25.4.11. If you disassembled the capstan only to lubricate it you will have to expose the bearings in the raceway of the small bearings at the top of the base. Use the same technique as you did for the lower bearing set, that is, extract the split ring retainer etc.

5.25.4.12. To lubricate the exposed bearings and raceway, get the tube of artist brushes from the deck tool kit. Take out the brush that has the translucent sleeve not the blue sleeve, over the bristles.

Get the white container of lubricant labeled “W.B.G.”, white bearing grease. Take off the caps and get some grease on the brush. Paint some grease inside the raceway and on the exposed bearing surfaces, it is not necessary to “pack” the bearings, just a very light coat goes a long way. The large bearing of the practice capstan has the right amount of grease.

5.25.4.13. After lubrication, reinstall the seal *disk*. To reinstall the *split ring retainer*, use the Xacto knife. Insert one end of the *split ring* between the retaining ledge and the seal *disk*; hold it with your forefinger. Maneuver the other end of the *split ring retainer* with the Xacto knife into place and it should just snap right in. Repeat this process for the other bearing.

5.25.4.14. To reinstall a capstan/shaft, first install any shims that may have come from the top bearing. Get the z-moly cloth and work some into the shaft of the capstan, this will help to seat the bearings that fit very tightly on the shaft.

5.25.4.15. Place the capstan, rubber end down on the bench, slide the base on to the shaft small end first, keeping it as true as possible. Any angular skew will prevent the shaft, or bearings from pressing into place. Get the 5/16” nut drive shaft (only). Inspect the nut entry end, it should be flat and free of any particulates.

NOTE

The flattened surface of the 5/16” nut drive will contact the center surface of the large bearing and yet avoid the outer shelf of the capstan shaft, and the center cavity of the nut drive will accept the capstan shaft.

5.25.4.16. Place the nut driver over the shaft in contact with the large bearing. Keep the base lined up with the shaft. With the large plastic mallet, carefully drive the base section on to the capstan shaft. Insure that the base is fully seated at the capstan end by comparing the assembly to another capstan assembly having the same color rubber.

5.25.4.17. Reinstall the shim(s) you previously removed from this end of the assembly. Using the snap ring tool, reinstall the snap ring, and insure that it is fully seated.

5.25.4.18. Inspect the capstan assembly for the same characteristics as you did originally. (There may be some spin drag at first due to the new grease flow, but it should disappear if you spin the capstan by riding the very top edge along the workbench under moderate pressure a few times). Set the capstan(s) out of harms way.

5.26. You evaluated the clutch performance in section 5.5.7. You also removed it. The clutch was too loose, too tight or good. Check your notes. This section tells you how to correct clutch malfunctions.

NOTE

Once again we find that our process can improve on the performance of a new replacement part. Please see attachment 6, figure 4 for parts reference.

5.26.1. There are three modes of failure associated with the clutches:

- clutch too tight, the most predominant,
- clutch too loose, occasionally,
- excessive clutch wobble, rarely.

5.26.2. Now you need to bench test the *clutch*. From the round kit, get the clutch test pouch. Take out the 1-1/2" long shaft that has a ¼" round base hex nut threaded on one end.

5.26.2.1. Remove the soft jaws from the vise. Get a 1/2x 2" piece of polishing paper; fold it in half with the grit side out. Wrap it once around the unthreaded end of the shaft and install that ½" end into the side of the vise jaws with the shaft sticking out horizontally. Remove the hex nut. Install the clutch, with the screw heads outward, onto the threaded shaft with the hex nut.

5.26.2.2. Get the belt tension adjusting tool, bin location C3-3-E, pouch A. From the clutch test pouch get the hook that is attached to a fine threaded1/16" dia screw with a small nut. Install this hook assembly, snugly but not tight, into the threads of the round shaft end of the tension tool. Set it aside.

5.26.2.3. Get the string from the clutch test pouch. Do not untie the loops in the string. Pass one "loop end" through one of the ¼" dia holes of the clutch. Spread that loop open, than pass the other "loop end" through it. Pull the string tight so that you can feed the string and wrap it around the clutch five or six times.

5.26.2.4. Install the hook end of the tension tool into the free loop of the string. Snug up the tool but do not allow the *clutch* to unwind yet. On the shaft of the "T" end of the tension tool, find the o-ring. Slide that o-ring up to the blue handle. Make sure that the graduated scale at the "T" end is facing up and readable.

5.26.2.5. Make sure that if you step backward from the *clutch* about three feet that there is nothing in your way to trip over. Shortly you will be watching the action of the graduated shaft of the tension tool for an initial or "peak" amount of tension followed by a lesser (usually) but constant amount of tension indication on the tool scale. You will note both of these indications. The position that the o-ring stops on the shaft is the marker for the inch-ounce indication.

5.26.2.6. Slowly apply a constant tension to the string, stepping backwards as needed to allow the *clutch* to rotate. Note the initial (static) drag and the lesser (dynamic) rotating drag. You may have to repeat the test a couple times to get the feel of it.

5.26.2.7. The static drag figure, and the rotating drag figure should be in the range of 16 to 18 inch-ounces. Also the dynamic drag should be smooth without vibration or snags.

5.26.3. To correct any of the *clutch* problems you must disassemble it in steps. First remove the three screws at the *pressure plate*. Carefully raise the *clutch* up to eye level so you can evaluate and note the elevation of the *pressure plate* from the top of the *pulley case*. The *pressure plate* should be about 1/32" to 1/16" lifted from the surface of the *pulley case* due to the internal spring pressure, and it should be level.

5.26.3.1. Get the sharp 30-degree tweezers. Get a piece of Texwipe to place the *clutch* components on. In the next step, as you remove the pieces you will note that four components have three extremely small *pins* that are permanently attached. These pins engage three holes in each of the two *springs*.

5.26.3.2. Using the tweezers, carefully remove each of the internal components. Note the amount of lubricant between the *pressure pads* and the *pulley hub* inside the clutch. If the clutch was too tight, but there was plenty of lubricant between the two pressure pads, then check the surfaces for roughness. If they are scored that is the cause. Correct roughness on the *pressure pads* with the flat polish method. Eventually a *pressure pad* will wear down (in five years this has yet to occur) we have many in our bench stock salvaged from long ago along with other clutch parts.

5.26.3.3. To correct roughness on the *pulley* hub, use the round polish and finish method. The *pulley hub* is exceptionally hard metal and difficult to polish. Get the 1-1/2" long shaft form the round kit that has a ¼" hex nut with a round base on it. Use it as your axle for the pulley hub in the drill/stand. Replacement of the lubricant is described later.

5.26.3.4. If the cause for tightness or looseness was not lubricant or roughness, then by default the wavy washer *spring* tension is the cause. Observe that the wavy washer *spring* has three humps and three dips. To increase clutch tightness you would increase the height of three humps and the converse holds true. But this must be done in a specific manner.

5.26.3.5. Usually changing the height only needs to be done on one of the *springs*. To find out which *spring* needs work; sandwich the *springs* between two flat surfaces and compare the height to make your choice (as a function of the symptoms).

NOTE

If this is your fist attempt at adjusting spring tension you should get the blackened spring from the clutch test pouch and practice the bending process that is described below.

5.26.3.6. Get the wire bending pliers, not the needle nose pliers. These *springs*, if bent sharply, have a tendency to break near the pinholes. Grasp the *spring* at one of the three humps with the wire bending pliers directly on top of one of the pinholes. Use the thick area of the wire bending tool shaft. Place your thumb in the adjacent dip and increase or decrease the bend very slightly, repeat at the other two humps.

5.26.3.7. Compare the two *springs* again, you should see that the one you adjusted has changed in height.

5.26.3.8. Generally there is some wear evident on the *pressure plate* at the hole where the *pulley hub* contacts it. The same is true for the *pulley case* on the top surface of the raised chamber. These are hard to polish; sometime a Pink Pearl 400 soft pencil eraser can do it. Sometime you have to use polishing paper. To finish these surfaces, get the ½" diameter leather wheel from the finishing kit and yellow polishing compound. Use **extreme care** with the leather wheel at the *pressure plate* because you can easily dislodge the small metal *pins*.

5.26.3.9. If the cause for tightness was insufficient lubricant, or if you removed the lubricant for polishing, get the white bearing grease, (w.b.g.), container. From the deck tool kit, get the plastic tube containing the artist brushes. Take out the artist brush that has the translucent protective sleeve on it, it is only used to apply white bearing grease. Clean all of the parts thoroughly with a cotton swab and pieces of Texwipe.

5.26.4. There are five points to lubricate inside the *clutch*: three on the *pulley case,* and two on the *pulley hub*. These points will be lubed as you reassemble the clutch.

5.26.4.1. In the very center of the *pulley case* is a raised chamber (it accommodates the small cylinder of the *pulley hub*). Apply less than a drop of lubricant to the inside wall of this chamber and to its top round surface. (This is an extremely important surface region. The *pulley case* actually spins on the *pulley hub* in the tension release mode. The *hub* being extremely hard metal will wear down the soft aluminum *pulley case* at this point, causing another type of failure if not lubricated).

5.26.4.2. Using the tweezers, get the *spring* that did not require adjustment and place it inside the *pulley case* chamber. Insure that three holes in the *spring* engage the three stop *pins*. As you reassemble the clutch you must insure that all *spring* holes remain engaged with the appropriate stop *pins*, this can be a very delicate operation, so take your time.

5.26.4.3. Using the tweezers, grasp a *pressure pad* between two of the three holes with the *pins* facing downward. Align the three *pins* directly on top of the three holes of the spring and set it in place. Gently try to rotate the *pressure pad* inside the pulley case, it should not rotate if the *pins* are engaged properly.

5.26.4.4. Apply a light coat of w.b.g. to the wall of the chamber just above the pressure pad you installed. This will protect the wall from the *pulley hub* that will be installed next.

5.26.4.5. Get the *pulley hub*. Apply less than one drop (total) of the lube to the two faces of the disk. Using the tweezers, gently place the *pulley hub*, with the smallest cylinder facing downward, into the center chamber of the *pulley case*.

5.26.4.6. Using the tweezers, grasp the remaining *pressure pad* between two of the three holes with the *pins* facing *upward*. Place it on top of the *pulley hub*.

5.26.4.7. Using the tweezers, grasp the remaining *spring*. Gently place the *spring* on top of the *pressure pad* insure that the three lower holes engage the *pins* in the *pressure pad*.

5.26.4.8. Get the *pressure plate*, apply a light coating of w.b.g. to the center hole and the adjacent narrow surface that engages the pulley hub. Align the three *pins* with the three vacant holes of the *spring* and lay it in place. Gently lift the entire assembly to eye level to evaluate the distance between the top of the *pulley case* and the bottom surface of the *pressure plate*. You did this earlier. If you did a *spring* adjustment only, then the *pressure plate* should be higher than the original for more tension, and it should be lower than the original for less tension. Install the three screws to fasten the pressu*re plate* into the *pulley case*.

5.26.5. Repeat the bench test procedure to insure that you have achieved the required drag specifications. If the specifications have been met; be sure to put the artist brush away protected by the translucent sleeve. Return the string, the shaft and nut, the hook-screw assembly (which you attached to the belt tension tool), and the practice *spring* into the clutch test pouch. Place the belt tension tool in its protective pouch out of harms way, you will use it later.

5.27. There are three more *pulleys* mounted on the deck besides those attached to the capstans. Two of them, idler *pulleys*, are shown in figure 5-11as section L-L and again as plate L index 135. The other is the compound *pulley* (plate G index 125).

5.27.1. With the deck positioned upside down and the *camshaft* towards you, you can test each of these *pulleys* for spin characteristics. They should spin freely with gradual spin decay. There should be no discernable wobble, noise or endplay.

5.27.2. Before you remove a *pulley* for maintenance, trace the position of the bottom onto the deck surface. Also note the presence of a large shim at the base.

5.27.3. To disassemble the *pulleys* for lubrication or bearing replacement, refer to the previous *capstan* section. The bearings are much smaller and so are their components, use extreme care. Always work one *pulley* at a time.

5.28. There is one remaining *pulley (*index 110 of plate K). This one is mounted on the shaft of the synchronous drive *motor*, M1 (plate F at section K-K).

5.28.1. The ideal convex shape of the “belt contact” area is very gradually reduced by wear. The Teflon belts begin breaking or running off of the pulleys. When this occurs it is necessary to reshape the belt contact surface of the drive *pulley*. Visually compare the profile of the drive *pulley* to that of the tall compound pulley. If the drive *pulley* has become flattened with deep circumferential grooves then complete the following steps.

5.28.1.1. Get an estimate of the existing location of the drive *pulley* position on the motor shaft. Generally, a taffy stick will just fit between the motor end of the drive *pulley* and the surface of the motor mounting plate. Note that distance, it will be helpful when you reinstall the pulley.

5.28.1.2. Get the .050 setscrew driver, color-coded white on the handle, from the deck tool kit. Loosen the two setscrews and remove the drive *pulley*.

5.28.1.3. From the round kit get a ¼” dia shaft. Mount the shaft into the drill, and mount the drive *pulley* on the shaft with the belt surface area facing out. You will be using the drill as a low revolution lathe and an assortment of tools, mostly files, to sculpt the *pulley* into the desired shape.

5.28.1.4. Get the 1-7/16"dia pulley wheel from the round kit. Get the 6" stainless steel ruler. Place a long edge of the ruler across the convex surface of the pulley wheel and hold it up to the light. Note the extremely small bevels that create the convex face. You will try to duplicate to some degree these small bevels on the belt end of the drive *pulley*. Compare the profile of the pulley wheel to the profile of the small drive *pulley*. The bevel angle you make can be approximately 25% greater but not less than that of the sample *pulley wheel*. Also observe the light aluminum color in the center of the outer surface of the *pulley wheel* as opposed to the dark gray margins, that is an indication of the drive belt width, a handy point of reference.

5.28.1.5. From the storage cabinet bin location C1-11-A-5 get the pouch of *pulleys*. Inside the pouch find two *pulleys* that are labeled "A" and "B", they are samples only. Compare the *pulley* from the deck to the two samples.

5.28.1.6. Here are some precautions you will need for using a file as a cutting blade on aluminum, very important for sculpting a part as small as the drive pulley:

- Hold both ends of the file for positive control,
- Keep one end of the file in contact with the bench top with one hand, and use the other hand to accurately lever the cutting edge into position,
- **Never** press hard on aluminum with a file, pressing hard causes deep scratches and clogs the file,
- Use the file card (the specially designed wire brush) to clean the file frequently,
- Keep the file teeth moving on the surface being shaved,
- As you approach the final surface dimension, ease up on the file pressure to reduce the depth of the small scratches being made.
- Be sure that the drill rotation is in a direction so that the file teeth are cutting the material.
- Remember that you can never put back material that you have removed, so take your time.
- To aid in the visibility of the shaping process, color the entire surface to be worked with a dark color magic marker.

5.28.1.7. Refer to attachment 7, figure 5. A two step process creates sector "A" of the drawing. Compare the *pulley* profile to the drawing and to samples "A and "B". If sector "A" has not been created you will do that now. First, carefully use a six-inch triangular file to pre-shape the top margin toward the setscrew. Next sculpt that surface to a concave oval shape using an oval Swiss file.

5.28.1.8. See sector "D" of the figure, that region is approximately 3/32" wide, and the slope, angle "F", should equal the corresponding slope of the pulley wheel. Get a dark magic marker and color the entire work area of the pulley. Then as you shape each sector you will have an excellent indication of the boundaries you are working. Repeat the coloring step as often as necessary. If there is a great deal of material to remove, you can use the six-inch triangular file to get close to the required slope but you must complete the sculpting with a flat Swiss file. Use the straight edge of the six-inch metal ruler and the coloring technique frequently to evaluate your progress.

5.28.1.9. Sector "B" is next. Essentially the same technique is used but be very careful if you use the triangle file to rough in the surface. Do not create a deep scar at the intersection of sectors "A" and "B". You must maintain a smooth transition from the flat to the oval at that point. Make angle "E" equal to angle "F".

5.28.1.10. Hopefully sector “C” is the last region to be worked. It should turn out to be not wider than 1/8”. Do not remove any more material from this surface than is absolutely necessary.

5.28.1.11. Carefully inspect the pulley and compare it to the *pulley* wheel. It is acceptable for the *pulley* to have slightly larger slopes than the *pulley* wheel. Double the slope would be too much. Both slopes “E” and “F” should be equal, although the latter could be slightly greater. A belt will migrate toward the smallest diameter. It would be better if it migrated off the pulley and survive, than migrate toward the setscrew and be chewed up.

5.28.2. After you have achieved the required shaping of the drive *pulley* you will polish the new surfaces. Get an oval Swiss file to use for overlap, and a small piece of polishing paper of sufficient size to make an envelope for the file plus enough paper to grasp. Color the belt areas of the pulley. Smear a light coat of oil on the paper. With the flat smooth side of the oval file for overlap inside the paper envelope, carefully polish the flat surfaces you made. With the oval side polish sector “A”. Inspect your progress frequently; replace the paper as required.

5.28.3. Finish the surfaces to a moderate luster with leather.

5.28.4. Reinstall the drive *pulley* on the synchronous motor shaft at the location you noted in the removal process. Final positioning will be done later.

5.28.5. Return all parts and tools you used in this section to their original locations.

5.29. You are now going to prepare some parts prior to re-assembly of the *deck*.

5.29.1. Place the *deck* in front of you upside down with the head cable *connector* facing away. From the surface finishing kit get the 1-1/2” dia leather wheel with the long shank and install it into the drill chuck.

5.29.2. Remove the two screws that fasten the motor *plate* to the deck. Carefully lift the motor *plate* upward about one inch, rotate it, and position it to fully expose the actuator *bushings*, see plate B, index 79.

5.29.3. Get a piece of Texwipe and clean out the inside surface of both of them.

5.29.4. Remove the drill from the drill stand. Get a finishing cloth about 4x6” and fold it along the length. Place and hold it across the center face of the leather wheel and snug it up to the *bushing* opening. Slowly squeeze the trigger of the drill as you press the cloth-covered wheel into the *bushing*. You can prevent the polishing wheel from passing through the deck by placing a free hand underneath the deck at the bushing opening. Polish the inside wall to a brilliant luster. Repeat the process for the second *bushing*.

5.29.5. Return the polishing cloth. Replace it with a Z-moly lube cloth. Apply some Z-moly to the cloth that will contact the *bushing* and polish the *bushing* to obtain a slight bluish coloration. Repeat the process for the second *bushing*. Return the Z-moly cloth. Re-install the drill to the drill stand. Replace the leather wheel with the fuzzy cloth wheel from the surface finishing kit.

5.29.6. Get an *actuator assembly*. Mount it into the vise with the rectangular base facing upward so you can access the two rods and the adjacent walls in the slots. Get a cotton swab and clean out the

slots and the rods. Get a six-inch length of cotton twine. Apply some z-moly the middle two inches of the twine thread it under the rod and polish the entire rod and slot walls with the z-moly. Do both rods. Repeat the process for the other *actuator assembly*.

5.29.7. Re-mount the *actuator assembly* by the flattened sides into the vise standing up. There are some very deep scratches on the outer walls of the *actuator assemblies* from faulty maintenance years ago. They can not be removed without excessive dimensional change; polishing has neutralized their effects. Get a 1” wide strip of scotch tape-reinforced polishing paper and polish the full circumference and height. Repeat the process for the other *actuator assembly*.

5.29.8. Remove the *actuator assembly* and take it to the fuzzy polishing wheel. Finish the entire round wall; use white polishing compound as required to achieve a brilliant luster.

5.29.9. Get a Z-moly cloth strip fold it, apply some Z-moly to the middle and buff the *actuator assembly* the full height and circumference. Repeat the process for the other *actuator assembly*. Grasping the a*ctuator assemblies* by the top and the bottom ledges place them aside for now on a clean piece of Texwipe.

5.29.10. Get the *cam followers* plate B index 80. Polish the *cam* contact surface using the fuzzy polishing wheel and polishing compound.

5.29.11. Get the two *yoke* arms. Earlier, you polished them. You will now finish the surfaces you previously polished. There are seven flat surfaces to polish: the cam contact surface, the two sides facing the pinhole, and both sides of the fork ends. Use the fuzzy polishing wheel and white polishing compound.

5.29.11.1. Get the 1/8” dia shaft and some cotton. Install the smooth end of the shaft into the drill chuck and spin some cotton onto the scored end about 1-1/2” of sufficient thickness to finish the pin hole of the *yokes* an then the u-slots of the forks. Finish these locations using white polishing compound as required.

5.29.11.2. Replace the cotton on the 1/8” dia shaft. Apply some z-moly powder to the shaft and lubricate the pinholes and u-slots of the *yokes*. Lubricate the cam contact surface of the *cam followers* as well.

5.29.11.3. Reassemble the *cam followers* to the *yokes* using the original #4 bevel Phillips head screws.

5.29.11.4. From the deck tool kit, get the tube containing the Z-moly taffy stick. Apply Z-moly to the seven flat surfaces of the yokes. From here on you must handle the yokes only by the *cam* lever end that is not polished or lubed. Place the yokes near the *actuator assemblies* on the Texwipe.

5.29.12. Get the two yoke pivot *pins* item 83. Place one of them in the vise with the flat head against one jaw and the sharpened end against the other jaw. Get a narrow reinforced strip of polishing paper, oil it and buff out any scratches. Wipe the pin dry. Get a polishing cloth fashion it into a buffing belt and using polishing compound, finish it to a high luster. Wipe it clean. Get the Z-moly lube cloth, apply some dry Z-moly to it and buff the lubricant into the *pin*. Repeat the process for the other pin. Set both *pins* near the *yokes*. Return the cloths.

5.30. Near the start of this WI (paragraph 5.5.2.1) you recorded in your notes the height of the actuator *guides* from the top of the *deck* surface, which should be less than 1 mm when the *Engage/ Disengage lever* is in the engage position. You also wrote down where the M2 *yoke* arm contacts the *cam*. Get that information now.

5.30.1. If the height of the *guides* was within specification then of course no further action is needed. If the *guide* height was shallow then this section provides the corrective action. Thankfully, the equipment requires this section to be invoked only on the average of twenty months or so.

5.30.2. Get the *Engage-Disengage Mechanism*, consisting of a *shaft*, plate J without index 103, and *bracket and bushing assembly*, plate C-index 87 through 101. You removed this mechanism very early in this WI.

BACKGROUND NOTE

In the earlier history of this equipment, some design flaws prevented free movement of the *actuator assemblies* to engage and disengage the cassettes. This resulted in severe damage to the *cams*, *yoke* arms, *shafts* and *bushings*. Now there are no *cams* available in the supply system. This work instruction corrects all of the flaws.

5.30.3. Look at the surface of the *actuator cam* (plate J-index 105). You will see two scalloped distortions on the high side of the cam lobe. Even though the engage-disengage function still rotated smoothly with very little rotational force input, the *cam* has lost the required height. More importantly, the contacting surface of the *yoke* arm was not galled, and no associated components have been damaged. In the repair process refer to attachment 8, figure 6.

5.30.4. From the information in your notes determine the location of the surface area on the *actuator cam* that needs to be built up and by how much. For example, if actuator M2 was 3 mm below the top surface of the deck, and the *yoke* arm 2 contact to the *cam* is the outermost end of the *cam*, then that surface must be built up by 3mm.

5.30.5. See attachment 8. This attachment shows an end view and an isometric view of three *cam* conditions: when new, after the long period of wear and neglect, and after reconditioning.

5.30.5.1. Consider the “worn” view. The surface of the *cam* was seriously galled to the extent that a region between the 10 o’clock and the 2 o’clock points was shaved. The associated *yoke* arms were likewise galled and shaved. This inherited condition was caused by accumulated friction of many moving surfaces in the chain of motion ranging from the shaft *bushings* all the way up to the walls of the *actuators*. Also certain cassette malfunctions contributed to this problem. As you may have noticed, we now painstakingly correct for friction by finishing and select lubricants, and the following procedures prevent this severe galling.

5.30.5.2. Now observe the “repaired” view of the attachment. The region between the 10 0’clock and the 2 o’clock points is built up. At approximately the 1 o’clock point see that there is a very slight lobe on the surface, this helps to compensate for some cumulative long term wear on components in the chain of motion. In the following steps you will repair the *cam* profile by building it up with lead free

solder. The hardness is excellent, and when properly lubricated the friction is low. It will **distort before** any components are **damaged**; this is sort of a "mechanical fuse".

5.30.6. Get the Weller soldering gun, the Weller soldering station, the lead-free solder and the Kester soldering paste. Clean off the actuator *cam* thoroughly with alcohol. Dip the *cam* into the soldering paste. As you install the *actuator cam assembly* in the vise by clamping on the two *brackets*, index 87 and 100, take care not to impinge upon the *actuator cam disks*, plate C-index 94. You can rotate the actuator *shaft* by using the silver handle pin punch at plate J-index 102 as you proceed. The following steps will challenge your soldering skills and patience.

5.30.6.1. You will deposit a layer of solder thicker than required usually about 3/32" at the thickest point. You will later shape and dress the lobe to achieve the graduated height required for the actuator *guides*. Position the vise over the waste can to catch flux or solder drippings, instead of your trousers. Look closely at the wear points on the solder, it will reveal to you the required location of the highest point on the lobe. Obviously, if both actuators were too low you will build up the entire lobe.

5.30.6.2. Set up the soldering station for 600 degrees and tin it with the largest possible amount of lead free solder on the end. Position it for quick and easy access.

5.30.6.3. Raise the temperature of the *cam* with the soldering gun at the shaft end of the *cam*, alternating to the shaft entry point into the *cam*, not on the solder surface of the *cam*. Shortly after the soldering paste has vaporized from the heat application apply the solder to the *cam* surface, using the solder station, but don't allow the tip to contact the *cam*. It is very difficult to solder steel so don't be disappointed if all of a sudden all of the solder just puddles off.

5.30.6.4. If the solder did puddle off, it will probably be necessary to tin the *cam* over the whole repair area, use a Xacto knife to scrape of any oxidants if needed. Use ample flux. Sometimes this has to be done in small patches until you cover the whole area. As you try to build up a thick layer of solder, it is helpful to rotate the cam so the liquefied solder flows toward the required hump area. Repeat the process until you have built up enough solder between the 10 and the 2 o'clock edges of the repair area.

5.30.6.5. When you think you have enough solder on the *cam*, double check to see if the deposit is in fact adequate across the full width of the *cam*, sometime a hump of solder leaves an adjacent dip. The *cam* is probably hot enough to allow you to (very lightly) "paint" the humps level with the solder station. When the deposit is adequate let it cool completely. Reduce the temperature of the solder station to 300 degrees; just in case have to try again. Let the *cam* cool down completely before proceeding with the next step.

5.30.7. You are now ready to pre-shape the *cam*. Clean it off with alcohol. Install the *actuator cam assembly* into the vise by the handle end of the *shaft* vertically, but avoid the two stop *pins* that are on the *bracket*. Get a fine tooth file and gently smooth out the surface of the solder to a gradual oval, bearing in mind the profile shown on the attachment. Do not remove much solder, you are shaping only. Change to a Swiss file and then to scotch tape-reinforced paper for a finish. The next series of steps will determine the adequacy of the *cam* shape and size.

5.31. To determine the final *cam* shape and size, you are going to install those components related to the "Engage-Disengage" function first.

5.31.1. Place the deck in front of you on the bench upside down with the head cable connector facing away. The large copper empty cylinder on your right is the location for *actuator assembly* 2. Adjacent to it is a double *flange* (plate B index 86), with two *bearings* in it. Wipe that assembly clean. Get a cotton swab with Z-moly powder on it and wipe the inside upper halves of the *flange* and the holes of the copper *bearings*. Repeat the process for *flange* 3.

NOTE

As you handle the parts in the following steps, avoid touching those surfaces to which you have applied Z-moly. Read the following six steps before proceeding.

5.31.2. Get *actuator assembly* 2. Look at the top of the *actuator assembly* and find the large cassette break release *pin* (plate E index 68). Now look at the bottom channeled area of the *actuator assembly* and find the word “pin” with an arrow. The arrow points to the location of the break release *pin*. Gently lower the *actuator assembly* into the actuator *bushing* so that the arrow is pointing at approximately 7 o’clock. The axis of the two small rods in the channeled areas of the *actuator* is about 45 degrees with respect to the front edge of the *deck*. Reach under the deck with your right hand to keep the *actuator* from falling through the *deck*.

5.31.3. With your other hand, get *yoke* 2 by the non-worked sides at the lever end. Sprinkle a very small amount of Z-moly into the pinhole. Make sure that the *cam follower* is facing downward. Move the fork end of the *yoke* into *actuator assembly* 2 at the channels, and engage the two small rods. Lower the lever-end downward, to position the pinhole of the *yoke* arm inline between the two *bearings* in the double *flange*.

5.31.4. Get the yoke *pin* (item 83) and insert it into the *flange bushing* from the far side, so that the pointed end faces you when inserted all the way through the flange *bearings*.

5.31.5. Secure the yoke *pin* in place with a *retaining ring*.

5.31.6. Install the M3 *actuator assembly* and *yoke* arm in the same fashion as above, **except** for the position of the brake release *pin*. The break release *pin* on the M3 *actuator* will be at the **4 o’clock** position.

5.31.7. Temporarily install the torque motor *plate* with two screws. Turn the deck over to see the top surface, with the cable head connector facing away from you. See figure 5-11. Compare the position of the two “alignment pins” (which are functionally the cassette brake release *pins*) in the figure to the deck. They should both be the same. Since the deck is right side up now, and M2 is on your left in the figure and on the deck, the M2 alignment pin is at the 4’oclock position and the M3 alignment pin is on the 7 o’clock position. Rotate the deck upside down again. And remove the screws from the torque motor plate, carefully shifting it out of the way as before.

5.32. The deck is now ready to accept the *engage-disengage mechanism* so that you can determine the final shape and size of the resurfaced *cam*.

5.32.1. Get the *engage-disengage mechanism*. Set it front of you on the workbench with the two *bracket and bushing assemblies* standing with the four screw holes vertical, the two thin, switch *actuator cams* (plate C index 94) will be slightly higher than the two *brackets*.

5.32.2. The *bracket* toward the handle end of the *shaft* has a setscrew on the bottom, which operates a ball and detent. Get the six inch metal rule and with the straight edge **insure** that the setscrew head is not protruding out beyond the flat surface of the bracket. Rotate the assembly back to the screw holes vertical position.

5.32.3. Get the silver handle pin punch; insert it into the cotter-pin hole at the handle end of the *shaft.* Rotate the *shaft* so that the yoke *actuator cam* is pointing to your left. At this point the long roll *pin* next to the handle end *bracket* will be pointing up. With the *engage mechanism* in this attitude you will shortly install it into the deck.

5.32.4. When you removed the e*ngage-disengage mechanism*, there were four long screws. The shorter pair of screws was 1-3/32" long and color-coded black at the top end of the shaft. The longer pair had a 1-5/32" long shank, make them readily available now.

NOTE

In the following step proceed with caution.
There are two *microswitches* on the left
that are hard to avoid, they must be
aligned to the two *switch actuator cams*.
Also you must not score the *yokes* or yoke *cam*.

5.32.5. At the intersection of the two *yoke* arms, depress and hold them so that they are flat in line. Get the *engage-disengage mechanism* and carefully position the *cam* between the *yoke* arms and the *cam followers*. Maintain pressure at the *yoke* arms as you complete the next two steps.

5.32.6. Position the two *brackets* within the etchings on the deck surface. Insure that the two thin *switch actuator cams* (plate C index 94) are in line with but not jamming the *microswitches*. The operators of the switches at this point will not be touching the cams; a piece of paper should fit between the cams and the switches.

5.32.7. Drop the two shorter screws into the *bracket* holes at the handle end of the *shaft*. Drop the two longer screws into the *bracket* at the yoke *actuator cam* end of the *shaft*. Snug up the screws on the innermost bracket **first**. You must be careful **not** to over tighten the screws in the outermost bracket because there is only 1/8 inch of metal there.

5.33. To accomplish the final adjustment of the *cam*, bear in mind that the actuator *cam* may be too large to allow it to rotate in the space between the *cam follower* and *yoke* arm surface. Get the silver handle pin punch and insert it into the cotter *pin* hole on the *shaft*. Stop and read the next step before proceeding

5.33.1. You will gently attempt to rotate the shaft 90 degrees clockwise. Closely watch the cam-to-yoke region for jamming while sensing the resistance to rotation of the *shaft*. If jamming occurs, immediately stop rotation. Estimate the amount of solder to be removed from the *cam*. If jamming

does not occur, which is usually the case, leave the *cam* pointed straight up. The stop *pin* on the *shaft* will be contacting the right side stop *pin* on the outermost *bracket.* Remove the pin punch.

5.33.2. Install the torque motor *plate* with two screws again. Rotate the *deck* right side up. Get the six inch steel rule. Use the straight edge to determine if both *actuator guides* (plate E index 77) are level to the top surface of the deck. If a *guide* is lower than the deck surface then you will have to add more solder to the *cam*. If a *guide* is higher than the deck surface then you might have to shave some solder from the *cam*. Continue reading before taking further action.

5.33.3. Do not be discouraged, this is an iterative process because no dimensions can be provided due to variations in wear patterns. However, the amount of solder to be removed or added equals the amount of error observed with the steel rule straight edge in place.

5.33.4. Do not rush this process by changing the actuator *cam* height in large amounts. Go easy with the file, the closer you get the finer the file and the less pressure to use. Earlier it was stated that you might have to shave some solder from the cam. If the guide was less than 1 mm too high that is good because you can reduce very small amounts of excess height by gently applying pressure downward on the offending *guide* while rotating the *camshaft* between full stops. The lead will usually compress. Be sure to end the shaping process with polishing paper.

5.33.5. Now that you are armed with all of the above wisdom, take appropriate corrective action. Remember, the short screws, color coded black are installed into the *outermost* bracket, and they are never over tightened.

5.34. If the *guide* height is correct for both *guides*, then the *engage-disengage mechanism* must be cleaned and lubricated. Make a mental note of the location of the innermost *bracket* on the *shaft*. Carefully remove the mechanism once again. You should be really good at this by now.

5.34.1. Grasp the *engage mechanism* by the two thin *microswitch cams*. Slowly rotate the *bracket* at the handle end back and forth through 180 degrees. The rotation should be easy and smooth, but at approximately the 2 o'clock and the 10 o'clock positions, the *bracket* should snap over and hold somewhat at each end stop.

5.34.2. If the response to the above is not good, then get a screwdriver and remove the *plunger* (plate H index 99). Test the ball-spring-housing viability by pressing on the ball against the flat surface of the six-inch metal ruler and your finger. It should take a fair amount of force to depress the ball into the housing and the ball should always reseat outward. If it does not, which is unlikely, you can soak it in alcohol first, exercise it, then soak it in general purpose oil and exercise it again. Wipe of the excess oil.

5.34.3. While the *plunger* is out, check the ease and smoothness of rotation of the *shaft* in the *bracket* again. It should rotate smoothly with ease. If not, flush it with alcohol and exercise it. Also flush the external washer surfaces. Dry it, and sprinkle some Z-moly powder inside the *plunger* hole, towards both ends of the *bushing*. Exercise it again to work the dry lube in.

5.34.4. Install the *plunger* into the *bracket*. Make absolutely certain the screw head does **not** protrude out beyond the bottom surface of the bracket.

5.34.5. Flush the *bearing* and *shaft* with alcohol, and clean it thoroughly. Earlier you noted the mounted position of the innermost *bracket* on the *shaft*. Move the *bracket* past that area. At the location where the *bracket* normally rides the *shaft*, sprinkle some Z-moly powder and exercise the *bracket* on the area to work in the lube.

5.34.6. Get the Z-moly cloth, sprinkle some Z-moly on it and wipe it into the actuator *cam*.

5.34.7. Carefully install the *engage-disengage mechanism* into the deck. Using the same technique you did earlier. Get the tube of Z-moly grease that you used much earlier on the *latch assembly*. Get the artist brush with the blue sheath.

5.34.8. With the torque motor *plate* temporarily in place, rotate the deck right side up. Incline the deck by about 45 degrees, so that you will have visual access to that very small region where the actuator *cam* resides inside the *yokes* and *cam followers*. Rotate the engage *shaft* so that he *cam* is pointing toward the underside of the deck. At this point the stop *pin* of the *shaft* will rest on the right side stop *pin* on the outermost *bracket*. Observe that *actuator assemblies* M2 and M3 are both retracted down into their *bushings* (copper sleeves). Observe that the plunger *pins* and the large brake *release pins* are all below the top of the deck surface.

5.34.9. Get the tube of Molykote. Get the artist brush with the blue sleeve. Apply 1/4 drop of the Molykote to the brush. Beginning at the surface of the *cam* where it touches the *yoke* arms, apply the grease to the *cam*. Exercise the shaft from stop to stop. Return to the starting position. Apply some Z-moly powder to the brush and repeat the application and exercise process.

5.34.10. Cover the artist brush with its sleeve, put it in the tube, and into the deck tool kit. Return the Molykote to its bin storage.

5.35. To test the microswitch *cams* (plate C index 94), turn the deck upside down with the *camshaft* toward you.

5.35.1. The final position of the engage mechanism is determined by the ability of the microswitch *cams* to operate the two *microswitches* (plate F index 89). The *cams* must not impinge upon the case of the *switches*, but they must be far enough away to allow the *switch* operator to disengage. Also, the two *cams* must be inline with the operators on the *switches*.

5.35.2. Insert the silver handle pin punch into the *camshaft*. Rotate the *camshaft* fully counter clockwise. The *cam* should be pointing toward the underside of the *deck*, and the *camshaft* stop *pin* will be touching the *bracket* stop *pin* on the left. Neither *cam* should be touching the *switch* operators (if you can slip a piece of paper between the *cam* and the *switch* operator they are not touching).

5.35.3. Slowly rotate the *camshaft* clockwise, one of the two *cams* will operate a *switch* at approximately the 1 o'clock position of the *camshaft* stop *pin*. You should hear a faint click when this occurs. (The first *switch* operation would, in normal operation, cause the *torque motors* to spin and engage the cassette reel mechanism as the cassette brake is released. The two pin *actuator* assemblies, M2 and M3 would be close to full height.)

5.35.4. Slowly continue to rotate the *camshaft*, at approximately the 2 o'clock position, the second *cam* will engage and operate the second *switch*. (The second *switch* would enable the synchronous *drive motor* (M1) circuit. The *drive motor* would not start until other things happen electronically. Pin

actuator assemblies are even closer to full height than they were.) The ball and detent takes over and locks the *camshaft* to the right against the stop *pin*. And the pin *actuators* are at their full height.

5.35.5. Verify the on-off action of the two *switches* by connecting an ohmmeter to the two wired pins of the *switches* as you rotate the *camshaft*.

5.35.6. The above requirements can be achieved by loosening the four *bracket* screws and repositioning the *engage mechanism*.

5.35.7. Only on rare occasions will the switch *cams* require relocation, or rotation on the *shaft*. Should this be required, use a 5/64 hex driver from the deck tool kit to loosen the actuator cam *clamp* (plate C index 93). Make the required adjustment and retighten the *clamp(s).*

5.36. Before the motor *plate* is fastened completely you will test the torque and the *torque motor* condition in its environment: without power for static opposition, with power (at two voltages) and the *actuators* as a load, and then in locked rotor. You will need the Deltron model RP30-2 variable DC power supply, the Waters, model 651C-3, torque watch and a Digital voltmeter. Place the deck right side up with the camshaft facing you. Rotate the *camshaft* to the energized position with the *actuators* fully elevated. In the following steps make a written note of any performance deficiencies for correction later.

5.36.1. Test the static opposition, with no power applied and the deck level, insert the torque watch connector to the two pins in the M2 actuator *guide*. Allow the weight of the torque watch to rest on the *guide*, and very gently attempt to rotate the torque watch. Observe the fixed pointer on the scale of the torque watch. The actuator should begin rotation at less than 3 inch-ounces, in both directions of rotation. Repeat the test for actuator M3. This indicates that there is no excessive friction in the motor with the actuator attached. If you had to test the *motor* alone the torque would be less than 2 inch-ounces.

5.36.2. Get the dual banana-to-alligator test leads (note the polarity of both ends of the leads versus the polarity of the female banana jacks on the power supply).

5.36.3. Lean the deck backwards so that you can see and later attach the test lead alligator clips to the torque motor connections at the bifurcated standoff *terminals* (plate F index 53, 4 places).

5.36.4. The torque motors are direct current motors, the direction of rotation is determined by the polarity of the applied voltage. They must rotate (or apply force) in opposite directions. Motor M2 must spin counterclockwise, and M3 must spin clockwise. In service, they apply force to the two reels in the cassette providing tension to the cassette tape.

5.36.5. Observe that on M2 the **positive** connection *terminal* is toward the front of the deck and the wires are color-coded **black**. But on M3 the **positive** *terminal* is toward the center of the deck and the wires are color-coded **white**. This arrangement provides the required polarity for the opposing rotation. Observe that each motor also has an electrolytic capacitor (polarized), another good reason to make sure that you apply the polarity described above when connecting the voltage source.

5.36.6. With no test leads connected to the Deltron power supply, turn it on. Turn the current adjustment fully clockwise. Adjust the output voltage to 15 volts as a preset. Turn the power supply off.

5.36.7. Get the test leads. Connect the red alligator clip to the front *terminal* (black wires) of M2. Connect the black alligator clip to the innermost *terminal* (white wires) of M2. Connect the double banana plug to the banana receptacle on the power supply observing polarity. Carefully set the deck level.

5.36.7.1. Turn on the power supply, the M2 actuator guide and pins must be rotating counterclockwise. If not turn off the power supply immediately and correct the connections. If the rotation direction is correct, get the DVM and read the applied voltage, it will be slightly low, so readjust the voltage to 15 volts.

5.36.7.2. At 15 volts, the normal, free run current draw should be less than .25 amperes. Read the current meter on the power supply. Turn the power supply off.

5.36.8. You will soon check the health of the motor in locked rotor condition, in terms of torque and current. This is a close simulation to actual operation, where the capstans are forcing one of the torque motors to rotate opposite to its intended direction. In locked rotor condition any motor develops increased current flow.

5.36.8.1. Get the torque watch; connect it to the M2 actuator as you did earlier, only the weight of the torque watch is to be applied to the actuator *guide*. Grasp and hold it firmly to prevent it from spinning out of your grip, because this time you are going to apply 15 volts and read the torque generated.

5.36.8.2. With a firm grip on the torque watch, turn on the power supply. With 15 volts applied at locked rotor, the motor should produce 20 inch-ounces or more torque at less than 1.1 amperes current draw. Remove the toque watch.

5.36.8.3. Reduce the applied voltage to 10 volts.

5.36.8.3.1. The free run current at 10 volts should be less than .2 amperes. Turn off the power supply.

5.36.8.4. You will now test the locked rotor torque and the current draw at 10 volts. Attach the torque watch as you did previously and hold it firmly.

5.36.8.4.1. The torque should be not less than 14 inch-ounces and the current draw should be not greater than .75 amperes.

5.36.9. Repeat all of the above tests for the M3 motor. Remember to observe the reversed wire terminal positions for M3 as indicated earlier in this section.

5.36.10. Since the life expectancy of the torque motors is greater than five years, motor rework and replacement is covered in Reference-028. If the torque motors passed all tests, return the test leads, turn off the power supply and place the DVM out of harms way.

5.36.11. Much earlier, in the deck disassembly section you were advised to note the wire tie placement and the routing of the wire bundles beneath the motor plate. The wire ties on the wire bundle are loose to facilitate easy removal of the motor plate and re-installation using the same wire tie. There are two or three loose wire ties (depending on the length of the wire bundles). The first wire tie attaches the bundle to the outermost standoff at M3 close to the underside of the deck next to the

M3 actuator bushing. The next wire tie is a permanent one in the middle of the motor plate that snugs up the bundle to the motor plate. The remaining loose wire ties guide the wire bundle on the upper inside of the two standoffs at M2. If this routing is followed, there will be no cables endangered by the chassis shelf during deck installation, and there will be safe clearance near the actuator region. Previous practices caused numerous problems due to cut and chaffed wires.

5.36.11.1. Install the wire bundle as explained above and then secure the motor plate with all five screws.

5.37. The capstan drive *motor*, M1 is a very dependable device. They usually outlast the torque *motors* unless there is a phase failure in the power source. Should this occur, the *motors* would overheat, lockup and create a horrible odor. Another cause of failure in times past was migration of oil from the *actuators*. The current *actuator* overhaul technique has eliminated this failure mode.

5.37.1. Therefor only two checks are required to evaluate the capstan drive *motor*, M1. Obviously the shaft should rotate very easily, quietly and smoothly, and there should be no endplay. It would not be cost effective to fabricate a two phase, 400 Hz fixture to test the synchronous drive *motors*.

5.38. All of the subassemblies requiring work in the overhaul are now complete. Most have been reinstalled. The read head is not addressed in this WI because it requires attention much more frequently than the overhaul. You will now begin the final assembly of the deck. Place the deck right side up with the *camshaft* facing you.

5.38.1. Earlier in this work instruction you removed the *alignment blocks* (figure 5.11 index 21, two places). Carefully install *alignment block* 2 on the M2 side of the deck. Use extreme care, avoiding any wires and the capstan, and install *alignment block* 3 on the M3 side of the deck. Reattach any wire clamps that may have been removed.

5.38.2. Get an open face “mechanical tape” cassette. Operate the *camshaft* to the disengage position, the *actuators* will descend. Depress the *cassette latch lever* full down, the *stop pin* will move forward about 1/8 inch and lock.

5.38.3. Install the cassette onto the deck. Loosen the two screws on each of the *alignment blocks*. The spring pressure inside the cassette will shift the *alignment blocks* to the rear of the deck. Tighten the *alignment block* screws. Reach under the front of the cassette with your thumb and depress the *latch lever* to release the cassette. Remove the cassette.

5.39. To install the Teflon belts, rotate the deck upside down with the camshaft facing away from you. This puts the back edge of the deck nearest you.

5.39.1. Insure that the two small idler *pulleys* (plate L index 135) are firmly secured in their original position with the shims in place. Insure that the compound *pulley* (plate G index 125) has the shim in place, with the flat side of the shim aligned to the left flat side of the pulley base. Insure that the narrow side of the pulley base is “pointing” toward you. Install the screws just snug enough to allow intentional movement.

5.39.2. Get a piece of Texwipe and wet a small area. Clean the each of the *pulley* surfaces that will contact the belts. Position a three-inch Reed and Prince screwdriver nearby for easy access.

5.39.3. Get the long Teflon belt that you removed at the beginning of this WI. Get a piece of Texwipe and wet a spot with alcohol and pull the belt gently between a wet fold in the Texwipe. You probably will not be able to remove all of the black streaks but the loose deposits will come off onto the towel.

5.39.4. Form a loop on the large belt about three inches in diameter and gently manipulate the loop over the large compound *pulley* wheel, down onto the small belt drive section, avoid snagging the M3 yoke arm *bracket* and *pin*, they will be in your way.

5.39.5. Apply a gentle tension to the free loop of the belt to keep it snug at the small drive of the compound *pulley.* Pass the free end directly out toward the back edge of the deck, between the faces of the two adjacent idler *pulleys*. Place and hold, the thumb of your free hand inside the belt to snug it up to the faces of both idler *pulleys* simultaneously.

5.39.6. Wrap the free end around a capstan *pulley* of you choice, and then do the other one, you may have to manipulate the compound *pulley* position to regulate the *belt* tension as you wrap the second capstan *pulley*. Rotating he last *pulley* as you position the *belt* helps to seat it. It may take a couple tries to get the feel of the process. Once you get the *belt* seated, apply a firm pressure on the compound *pulley* toward the front edge of the deck. Get the screwdriver and barely snug up the rear most screw of the compound *pulley*, because there is still some more positioning to do.

NOTE

Positioning the small drive *belt* is extremely important.
Failure to do it correctly will result in breaking the *belt*.

5.39.7. Get the short *belt*. Clean it they same way as the long *belt*. Pinch a loop about one inch in diameter in the *belt* and slip it over the drive *pulley*, being sure to engage the *belt* surface and not the larger collar surface.

5.39.8. Keeping mild tension on the *belt*, “walk” the other end of the belt around the compound pulley upper *wheel*. Rotating the *wheel* may help seat the belt.

5.39.9. Now that both *belts* are in place you are going to set the preliminary *belt* tension. Place your thumb at the top axle of the compound *pulley*. Apply pressure to the axle to move the compound *pulley* along a 2 o’clock vector. If you are musically inclined, strumming the small *belt* will approximate a “ti” and strumming the long belt will approximate a “doe” when you approach the proper tension. Snug up two screws of your choice just enough to keep the compound *pulley* stable, because you will soon measure the *belt* tension and move the compound *pulley* in very small increments for final tension. Do not spin the *pulleys* until told to do so.

5.39.10. Here is some discouraging news. The small *belt* may want to “travel” up or down the small *drive pulley* or the large compound *pulley* wheel and eventually either come off or break. To find out if the belt will ride level consistently, raise the back edge of the deck so you can see the *drive pulley* and the large compound *pulley* wheel and both edges of the *belt* as you perform the following steps.

CAUTION

In the following steps, do **not allow** the small drive *belt* to travel **up** the drive *pulley* onto the **collar**, it

will become damaged and break.

NOTE

If this is you first experience with the deck overhaul, read all the remainder of section 38. Then return to paragraph 5.39.10.1 and proceed.

5.39.10.1. Place your forefinger loosely at one of the holes on the compound *pulley* wheel and spin the compound *pulley* wheel rapidly a half dozen times. Reverse the direction and repeat. Observe the behavior of the drive *belt*, it should remain nearly centered and consistent on both *pulleys* in both directions of rotation.

5.39.10.2. If you did not reshape or reposition the *drive pulley*, the cause of travel is most likely the *belt* itself. They seem to develop a bias over time and you only have to turn the *belt* upside down.

5.39.10.3. If you had to reshape the *drive pulley*, then the cause for *belt* travel could be the vertical positioning of the *drive pulley* on the motor *shaft*. Get the .050 setscrew driver and reposition the *drive pulley* in very small increments, and retest, until you get the least amount of travel. If there is still a problem, the cause could be the *belt* bias, turn it upside down and retest.

5.39.11. After resolving unsatisfactory *belt* travel you will make the final tension adjustment. Get the belt tension-adjusting tool (you used it earlier on the clutch assembly). This is another high iteration process that requires patience.

5.39.11.1. General instructions for use of the belt tension-adjusting tool follow. Observe that the tool is “T” shaped. The two flat *faces* of the iodized aluminum “T” top will rest upon the belt at two *pulley* wheels. In the middle of the “T” top is a *fixed flange*. Also in the middle of the “T” top is a *movable plunger*. The variable space between the *fixed flange* and the *movable plunger* is the *tension gap*.

5.39.11.2. A belt suspended between two pulleys would be inserted between the *fixed flange* and the *plunger* into the *tension gap*, while the two flat *faces* would rest upon that belt at two *pulley* wheels.

5.39.11.3. The blue *handle* is spring loaded, and the movable *plunger* shaft within it, acts as a scale as it is pressed inside the spring-loaded handle. The *o-ring* serves as a pointer indicating the final amount of pressure exerted upon the *movable plunger*.

5.39.11.4. When a belt is properly suspended in the *tension gap*, the *o-ring* indicates the tension on the belt in *inch-ounce* units. This indication occurs at that precise point where the belt first touches the fixed flange (as you press the belt towards the fixed flange by the plunger shaft handle).

5.39.12. You will adjust the belt tension of the long *belt* first, with the belt tension of the short belt as a secondary consideration. Grasp the tool by the blue handle. Grasp the “T” with your other hand and gently pull the plunger away from the *fixed flange*. The *tension gap* is now open. Move the *o-ring* all the way down to the blue handle.

5.39.12.1. At the approximate center of the *belt*, between the two capstan *pulley* wheels, approach the *belt* from beneath with the “T”, and position the *belt* inside the *tension gap* of the tension tool.

5.39.12.2. Using the thumb of your free hand guide the "T" in contact with the two capstan *pulley* wheels. The *belt* is inside the *tension gap* and against the *plunger* face, and the "T" is in contact with both capstan *pulley* wheels.

5.39.12.3. While keeping both *pulley* wheels in contact with the "T", very slowly push the blue handle until the space between the *plunger* and the *fixed flange* disappears, then stop. Read the location of the *o-ring* on the plunger *shaft*. The acceptable range of tension is 12 to 16 inch-ounces. The closer to 16 the better. Make note of the reading.

5.39.13. Repeat this reading process for the small *belt*, using the drive *pulley* and the large *pulley* wheel of the compound *pulley*. Make sure that the "T" is in contact with the belt contact surface of the drive *pulley* and not the fastening collar. The tension requirement is the same for the small drive *belt*.

5.39.14. Unless you are exceptionally lucky, you will have to reposition the compound *pulley* to achieve the proper tension of 12 to 16 inch-ounces for both belts.

5.39.14.1. The adjustment can be frustrating, so take your time. In general, you are going to relocate the compound *pulley* base to achieve the required tension. By strumming the offending *belt* immediately before, during and after the relocation you will at least get an audible reference of your progress. The difficulty is achieving the proper tension for both belts. The reason for not tightening the three screws is to allow use of minimum force to move the pulley base, yet keep the pulley in position while being tested for belt tension.

5.39.14.2. Use a 5-inch x ¼" flat blade screwdriver as a punch or as a lever to relocate the compound *pulley* base. Obviously if a lot of force is required to move the base then the fastening screws are too tight, it does not require many turns to go from too loose to too tight. Also it is best to work only two screws at the compound *pulley* base during the setting process leaving the third one loose.

5.39.14.3. When using the screwdriver as a prybar, the fulcrum can be the drive motor standoff, or the M2 idler *pulley* base. Be sure that the pressure is being applied to the base of the *pulleys* and not the *ring clamps* (for example, plate L index 136).

5.39.14.4. After you achieve the proper tension on both *belts*, tighten all three mounting screws on the compound *pulley* base. Verify that the small belt in fact has no undesirable travel, by spinning the compound pulley fast for several turns in each direction.

5.39.15. After you have achieved the specified tension on both belts, return the belt tension tool to its bin location.

5.40. Turn the deck right side up with the camshaft facing you for polishing and lubrication of the deck top surface.

5.40.1. From the flat kit get the 1x4" rug pad. Wrap the pad with polishing paper. Lightly polish the top surface of the aluminum deck; wipe away from any aperture that might be harmed from aluminum dust. When done, get a piece of Texwipe wet it with alcohol and wipe off the aluminum deck.

5.40.2. From the surface finishing kit, get the z-moly powder, and the z-moly lube cloth. Apply a coating of z-moly to the aluminum top surface of the deck. Brush off any excess. Rotate the deck and brush of the bottom surface of the deck.

5.41. Update the Maintenance summary log, the appropriate computer file, and the DD form 1574 as required to show the completion of this deck. Return all tools to the appropriate kits, and the kits to the appropriate locations. Normally a deck is rotated to spare after overhaul when removed from R/T-A or R/T-B. Restore the workbench to the normal configuration.

6. REFERENCES:

6.1. T.O. 33DA115-3-1

6.2. T.O. 00-25-234

6.3. REF-009, Head polishing and preparation procedures

6.4. REF-028, Torque and synchronous motor procedures

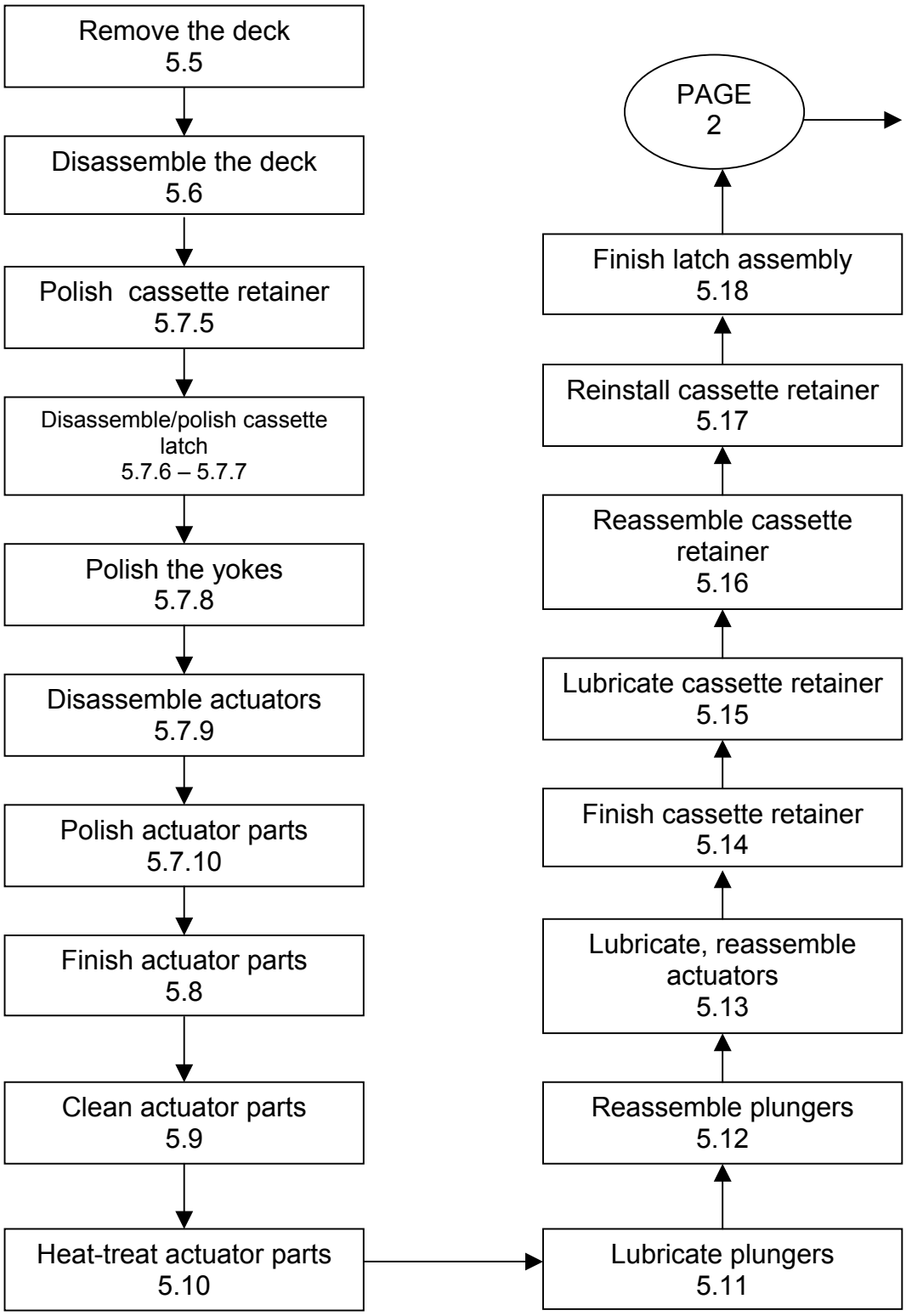
7. RECORDS:

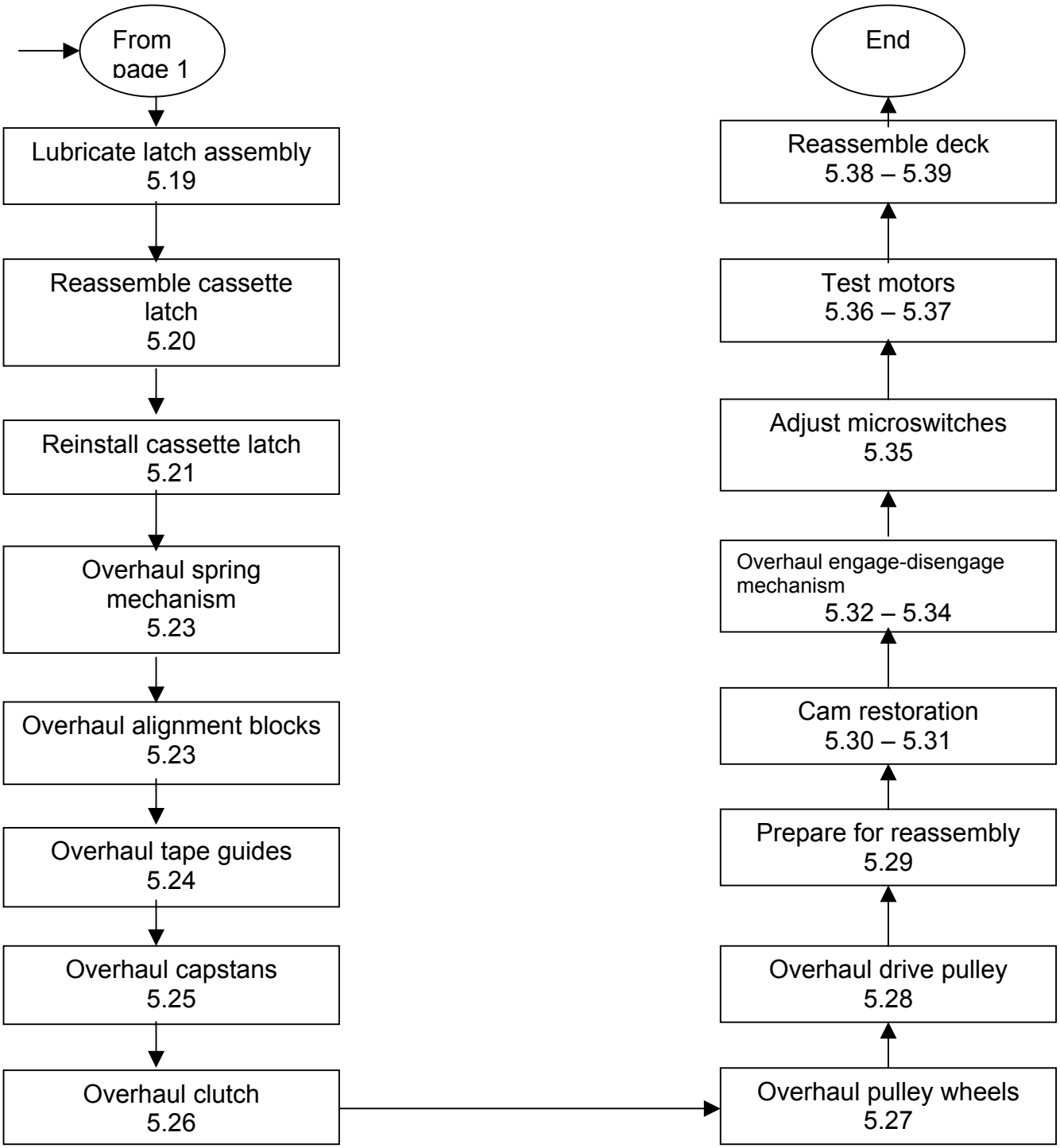
7.1. Maintain in accordance with AFMAN 37-139

Governing Requirements	Specific Record	Resp Org	Stor Site	Form or Rcrd#	Filing Method	Ret. Time	Security Class	Remarks	Electronic Records Backup Method
AFMAN 37-139	DD 1574	ENFOC	ENFOC	DD 1574	With rebuilt deck	3 years	Unclassified		N/A
AFMAN 37-139	ENFO form 14	ENFOC	ENFOC	ENFO form 14	File	3 years	Unclassified		N/A
AFMAN 37-139	Master Maintenance Inventory	ENFOC	ENFOC	Master Maintenance Inventory	File	Indefinitely	Unclassified		N/A

8. ATTACHMENT:

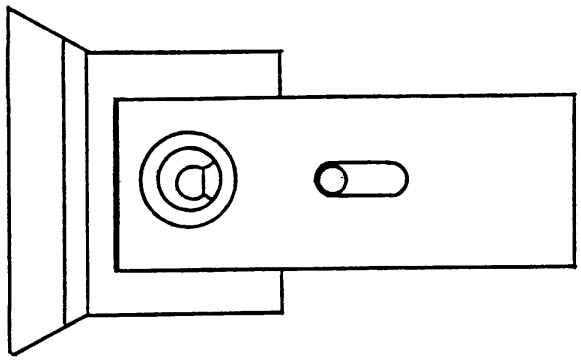
1. Process Flow Chart
2. Sequential index
3. Figure 1, Cassette latch assembly
4. Figure 2, Spring mechanism assembly
5. Figure 3, Capstan
6. Figure 4, Clutch
7. Figure 5, Drive pulley
8. Figure 6, Actuator cam

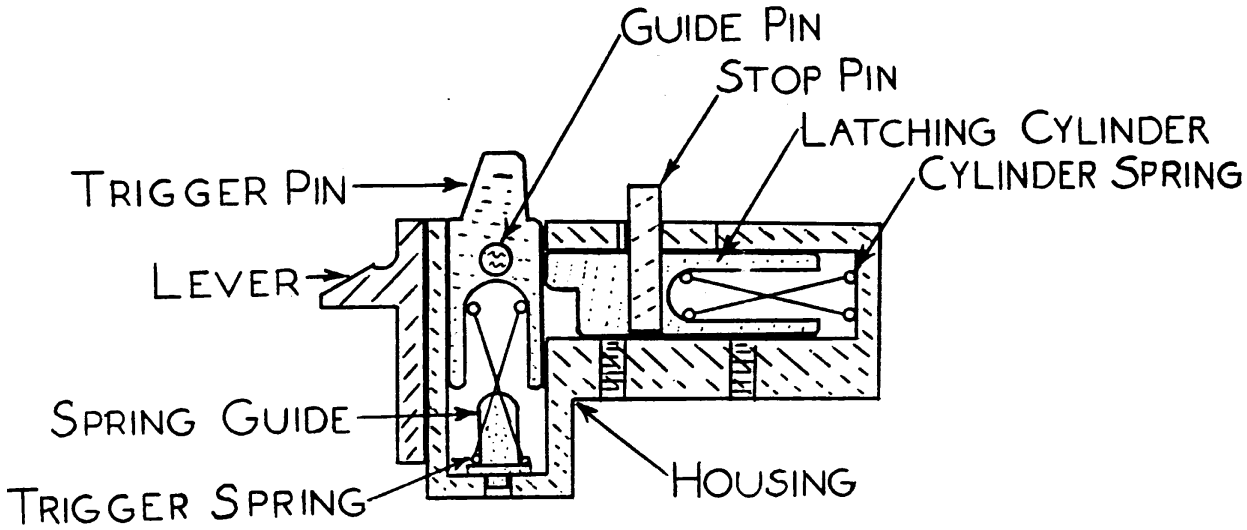

Remove the deck
5.5
Disassemble the deck
5.6
Polish cassette retainer
5.7.5
Disassemble/polish cassette latch
5.7.6 – 5.7.7
Polish the yokes
5.7.8
Disassemble actuators
5.7.9
Polish actuator parts
5.7.10
Finish actuator parts
5.8
Clean actuator parts
5.9
Heat-treat actuator parts
5.10
Lubricate plungers
5.11
Reassemble plungers
5.12
Lubricate, reassemble actuators
5.13
Finish cassette retainer
5.14
Lubricate cassette retainer
5.15
Reassemble cassette retainer
5.16
Reinstall cassette retainer
5.17
Finish latch assembly
5.18
PAGE
2


From page 1
Lubricate latch assembly 5.19
Reassemble cassette latch 5.20
Reinstall cassette latch 5.21
Overhaul spring mechanism 5.23
Overhaul alignment blocks 5.23
Overhaul tape guides 5.24
Overhaul capstans 5.25
Overhaul clutch 5.26
Overhaul pulley wheels 5.27
Overhaul drive pulley 5.28
Prepare for reassembly 5.29
Cam restoration 5.30 – 5.31
Overhaul engage-disengage mechanism 5.32 – 5.34
Adjust microswitches 5.35
Test motors 5.36 – 5.37
Reassemble deck 5.38 – 5.39
End

Sequential index

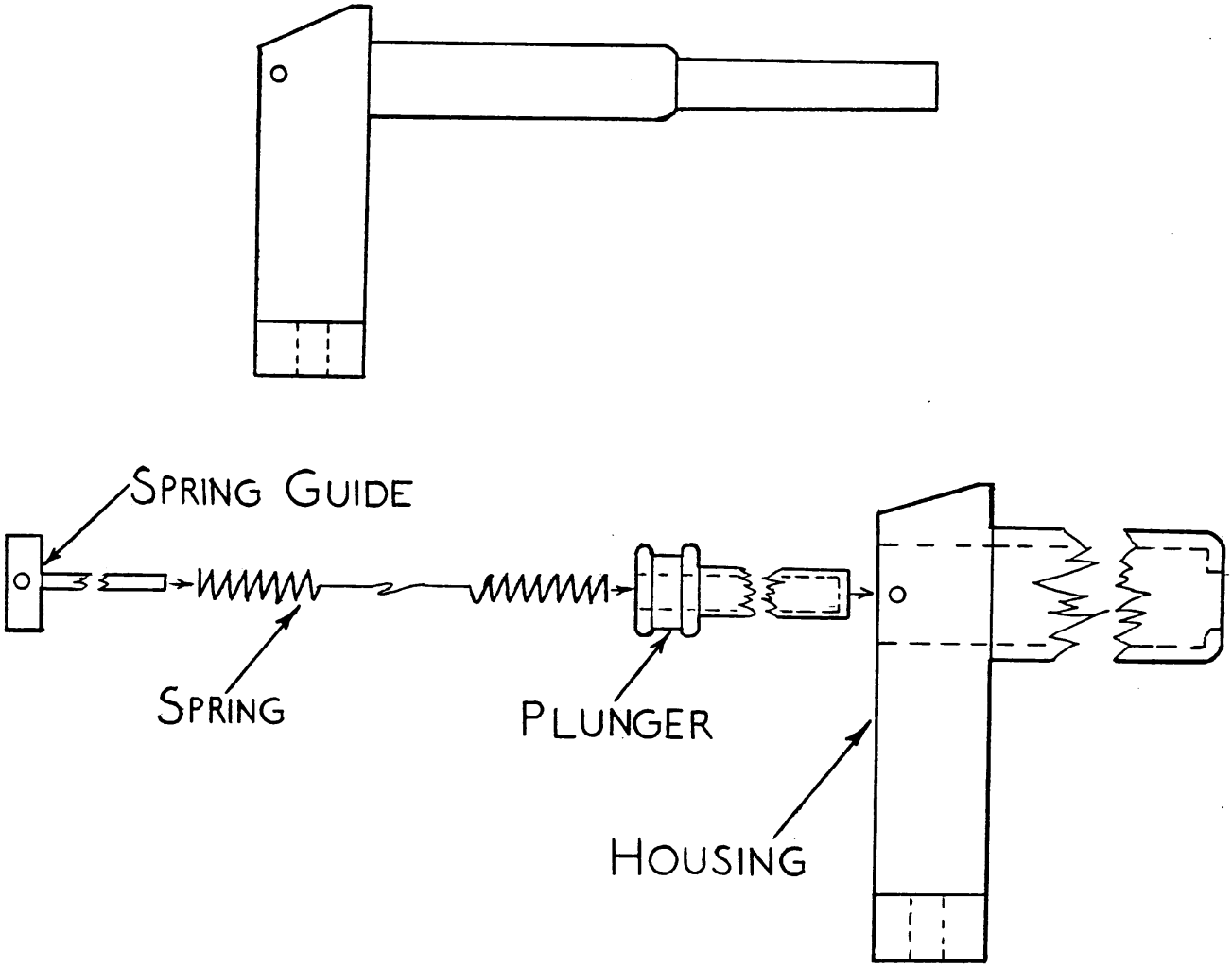
PARA. SUBJECT





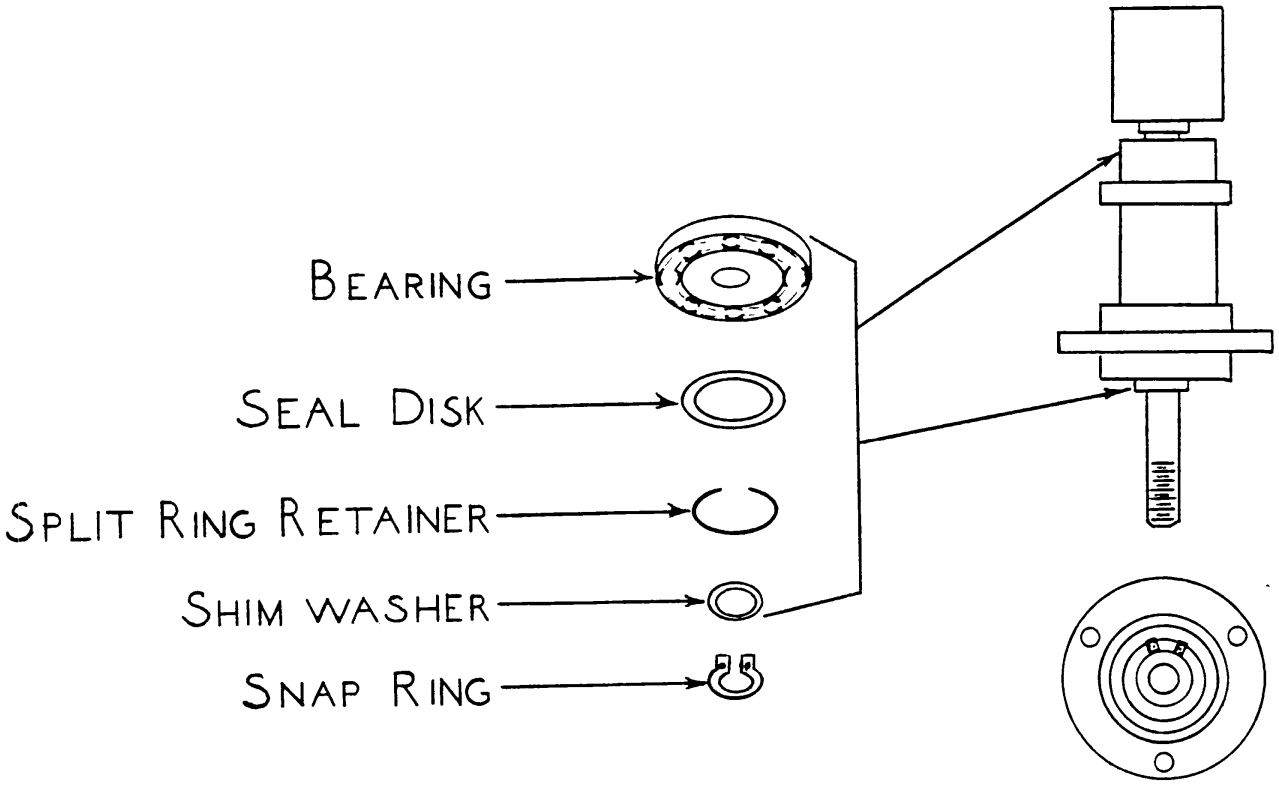
CASSETTE LATCH ASSEMBLY

FIGURE 1



SPRING MECHANISM ASSEMBLY

FIGURE 2



CAPSTAN

FIGURE 3

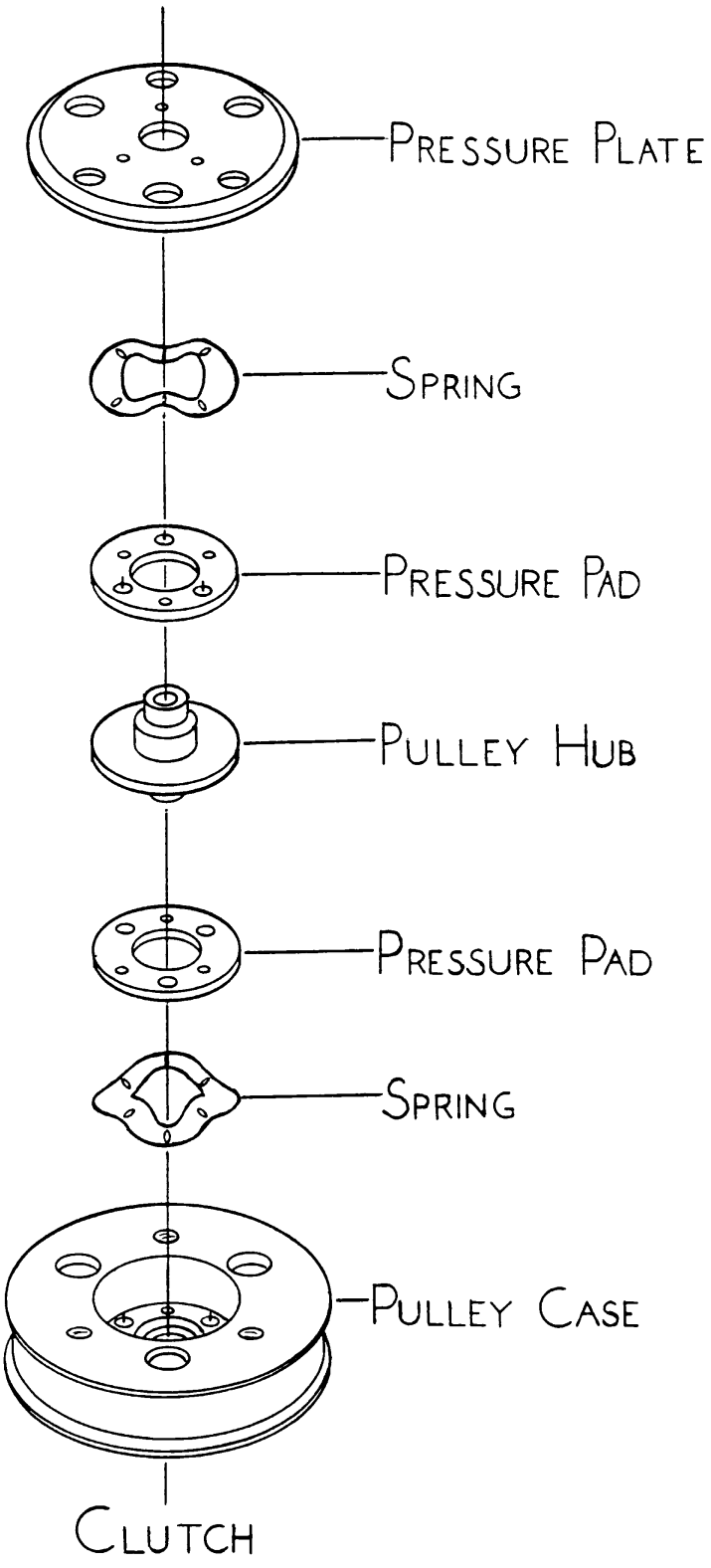
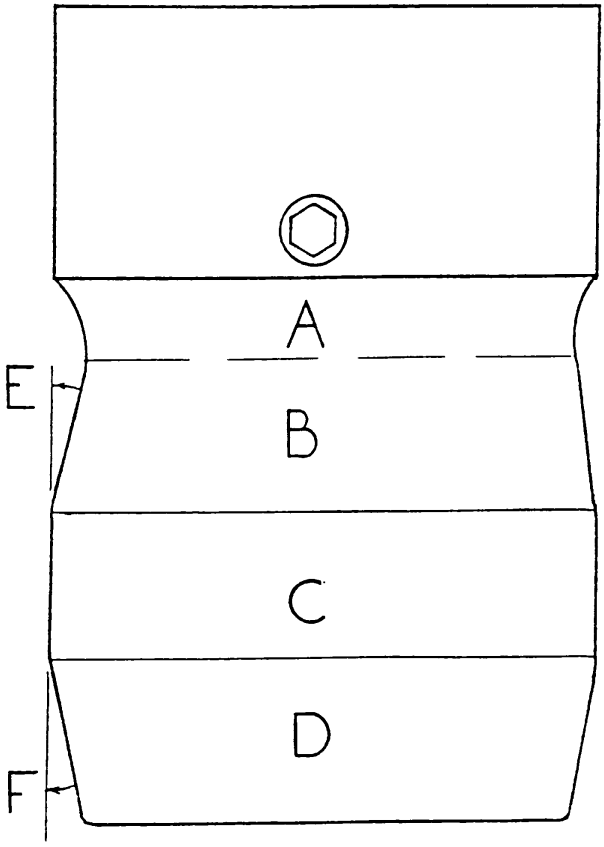
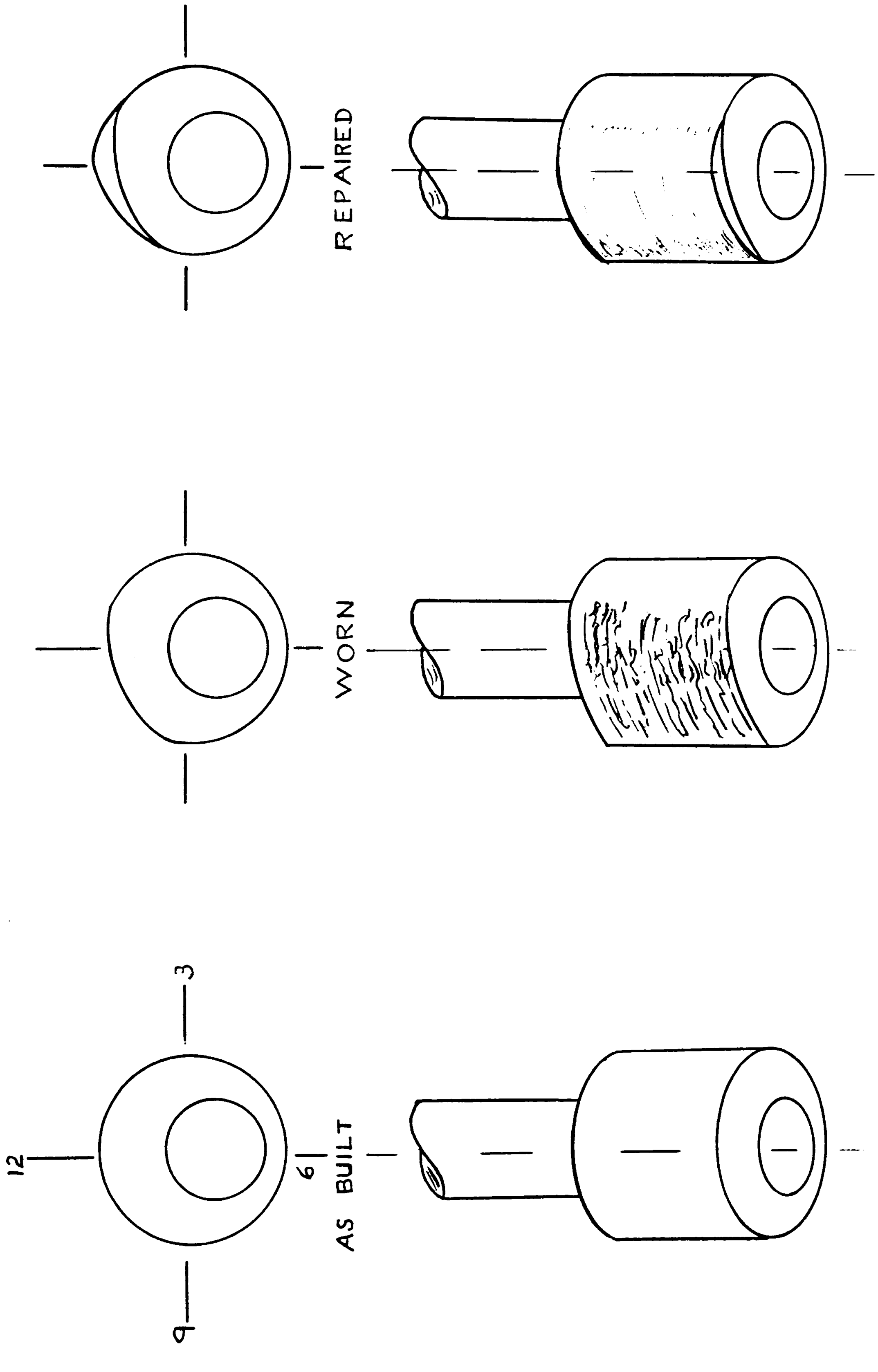

PRESSURE PLATE
SPRING
PRESSURE PAD
PULLEY HUB
PRESSURE PAD
SPRING
PULLEY CASE
CLUTCH

FIGURE 4



DRIVE PULLEY

FIGURE 5



ACTUATOR CAM

FIGURE 6

Worksheet for ENFOC-WI-0015, Deck Overhaul

Date:
Technician:
Deck Local Serial Number:
Head Local Serial Number:

Items to be documented:
1.0 Para 5.5.2.1 Actuator guide height
Guide number _____ Guide number _____

Yoke are 2 engages cam towards the **end** or **middle** of shaft (see Para 5.6.6)

2.0 Para 5.5.7.1.1 and 5.5.7.1.2 Belt tension test / Cutch check

3.0 Para 5.25.4.3 Capstan shim washer count

4.0 Para 5.26.2.5 and 5.26.2.6 Clutch Check notes

5.0 Para 5.36 Performance Deficiencies

6.0 Para 5.39.12 Tension reading for drive belt